NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

STRATEGIC ASSESSMENT OF LEAN SIX SIGMA PRACTICALITY IN THE TURKISH ARMY

December 2015

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REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704–0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** December 2015	**3. REPORT TYPE AND DATES COVERED** MBA professional report	
4. TITLE AND SUBTITLE STRATEGIC ASSESSMENT OF LEAN SIX SIGMA PRACTICALITY IN THE TURKISH ARMY			**5. FUNDING NUMBERS**
6. AUTHOR(S) Sadik Dogan, Sinan Kose and Osman Ertugal			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number NPS.2015.0060-IR-EMZ-A			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			**12b. DISTRIBUTION CODE**

13. ABSTRACT (maximum 200 words)

Lean Six Sigma (LSS) has proven to be a very effective method of continuous process and quality improvement in the private sector for the last several decades. The achievement acknowledged by top companies like General Electric, Toyota, Motorola, and Raytheon Corporation has also propelled the utilization of LSS in the U.S. Department of Defense (DOD). The DOD has obtained successful results from LSS implementation in selected Army depots and arsenal facilities, Navy maintenance, and Air Force Material Command.

There has also been growing interest in the Lean Six Sigma concept in Turkish private industry since the 1990s. However, the Turkish military has not yet become acquainted with LSS. In this respect, the primary goal of this study is to introduce the LSS method, deliver examples of LSS implementation, and inquire into the practicality of LSS in the Turkish army. We conducted a survey to measure the organizational readiness to change and continuous improvement for Lean Six Sigma implementation with Turkish and U.S. students at the Naval Postgraduate School. The survey results indicate that there is no significant cultural difference between the U.S. and Turkish military organizations that likely would hinder the successful implementation of LSS. This report discusses the findings of the survey and concludes with recommendations and managerial guidelines for an effective practice of LSS in the Turkish army.

14. SUBJECT TERMS Lean Six Sigma, Turkish army, cultural difference, continuous quality improvement, organizational readiness for change			**15. NUMBER OF PAGES** 107
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540–01-280-5500 Standard Form 298 (Rev. 2–89)
Prescribed by ANSI Std. 239–18

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STRATEGIC ASSESSMENT OF LEAN SIX SIGMA PRACTICALITY IN THE TURKISH ARMY

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Submitted in partial fulfillment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

NAVAL POSTGRADUATE SCHOOL
December 2015

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LIST OF ACRONYMS AND ABBREVIATIONS

COPQ	Cost of Poor Quality COPQ
CQI	Continuous Quality Improvement
CTQ	Critical to Quality
CTS	Critical-to-satisfaction
DFSS	Design for Six Sigma
DMADV	Define, Measure, Analyze, Design, Verify
DMAIC	Define, Measure, Analyze, Improve and Control
IND	Indulgence versus Restraint
LSS	Lean Six Sigma
OD	Organizational Development
PDCA	Plan-Do-Check-Act
PORC	Perceived Organizational Readiness for Change
PPM	Parts per Million
SME	Small and Medium Size Enterprises

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ACKNOWLEDGMENTS

The project members owe a debt of gratitude. Therefore, we would like to thank the following professors whose assistance, experience and highly valuable knowledge made this project possible:

- Lecturer LTC Bryan J. Hudgens, USAF (Ret.): Lead advisor, mentor, primary editor, and great source of guidance, direction and knowledge.
- Professor Uday Apte: Co-advisor, mentor, and source of new ideas and direction.

We would also like to thank all our Turkish and U.S. friends at NPS for their support to complete this research project.

Finally, we are very grateful to our families for their continuous love, encouragement and support.

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I. THE TURKISH EXPERIENCE WITH SIX SIGMA

In the competitive business environment of the twenty-first century, corporations need to be "dynamic and quickly-responsive to disturbances, which are not deterministic functions of time, but rather, exhibit random fluctuations" (Pande, Neuman, & Cavanagh, 2000). Such a stochastic environment stimulates business into new efforts to formulate cures which yield dramatic improvements. New approaches are being built on a set of well-established traditional methods and tools looking at any possibility of cost-cutting and wise use of scarce resources. Today the emerging consensus is a high rate of quality improvement since competition in quality has become a permanent reality. Customers' expectations of improved quality are transmitted through the entire supply chain which, in return, necessitates increasing rates of operational performance and quality improvement throughout the system. In such a challenging environment, statistical methods play an ever more important role. Several quality improvement strategies strongly rely on statistical methods. These strategies are very useful since they can guide quality professionals through structured methodologies, including a coherent series of steps, rules, and tools to achieve effective problem identification and a solution framework.

One of these approaches, Six Sigma, has become a successful quality improvement framework across corporations in the last decade. Popularized with the Define, Measure, Analyze, Improve and Control (DMAIC) cycle, and then extended to the Design for Six Sigma (DFSS) or Define, Measure, Analyze, Design, Verify (DMADV) methodologies, Six Sigma methodology has experienced an exponential growth in deployment (Pande et al., 2000).

With its high-profile adoption by industry giants such as General Electric, Motorola, Honeywell (formerly Allied Signal), and Raytheon Corporation, business has witnessed numerous corporations claiming notable successes from use of this methodology. Six Sigma consulting organizations mushroomed correspondingly, and books and information in print, in audio-visual media, and on Internet sites grew exponentially (Goh, 2002). Many people believe that Six Sigma works well because it is

based on statistical science and focused on achieving business goals. It relies on project by-project improvement and a high level of top management commitment and involvement.

Organizations experience various outcomes from process management techniques like Six Sigma because they do not implement the efficiency-generating practices at all (Westpal, Gulati, & Shorteli, 1997; Zbaracki, 1998), they implement them ineffectively, or they fail to give the new practices sufficient time to work (Sterman, Repenning, & Kofman, 1997). Six Sigma can help organizations deal with the increasing pressure to improve quality and customer satisfaction while decreasing costs and increasing operational performance.

Although Six Sigma has gained popularity in business, academic research on the methodology is limited (Linderman, Schroeder, Zaheer, & Choo, 2003). Many benefits are attributed to implementing Six Sigma, from improving operations to reducing variability; however, empirical data relating to Six Sigma and its benefits is limited. There are numerous papers by practitioners and consultants recommending Six Sigma, but empirical research on key requirements for Six Sigma is scarce. This study is designed to supplement current research on its use in both the service sector and the army.

Turkish industry faced the so-called Six Sigma phenomenon in the middle of the nineties during a campaign for quality and long-term business excellence. Its expansion was stagnant during the years before 2000. Since then, its influence has gained acceleration for the Turkish companies that have embraced it. Initially adopted by an organization that manufactures parts for GE, one of the Six Sigma pioneers in the world, the methodology is also being applied by some small and medium size enterprises (SMEs). However, the majority of SMEs either do not use the approach or consider it unsuitable for their organizations due to financial and personal capacity restrictions. We could not find a suitable example of Six Sigma implementation in Turkey's service sector. The best implementations of Six Sigma in Turkey are in manufacturing, where the success of Six Sigma is clear in terms of the products produced and time and money saved. However, Six Sigma is becoming increasingly important not only for SMEs,

which employ the greatest portion of the working population and provide the largest portion of manufacturing output in Turkey, but also for the service-related sectors like health care and education. SMEs, with their small but flexible structures, are more resilient to economic disturbances and have a critical role in supplying goods and services to large corporations. Therefore, encouraging them to implement Six Sigma can be beneficial to both parties.

The growing interest in the Six Sigma approach in Turkey, because of its successful implementation in many well-known Turkish companies and its spread curve pattern similar to the one observed in the global business arena, suggests the need to investigate the current status of Six Sigma implementations not only in Turkish industry but also in the service sector. Based on experiences of several major world leader organizations, both in industrial fields and in the service sector, we have derived some recommendations for Lean Six Sigma (LSS) implementation, which can guide organizations, including the military. Simultaneously, we sought to introduce Lean Six Sigma phenomenon to the Turkish army by presenting the results of the implemented practices by the Department of Defense of the United States of America. Looking at the implementations of the best-in-class Lean Six Sigma practitioners should result in identification of key success factors which will be useful in applying the fundamental rules for quality improvement.

Since Lean Six Sigma is a new phenomenon to Turkish private industry, in the Turkish army, there are no studies related to implementation of Lean Six Sigma. Thus, we first needed to determine whether the Turkish military mindset would be open to a new concept in quality improvement methodology, so we conducted a survey. To observe the differences between the cultures of Turkey and the United States, we conducted our survey among the Turkish and U.S. military resident students at the Naval Postgraduate School.

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II. SIX SIGMA LITERATURE REVIEW

Six Sigma claims to improve process or product quality. Although a unique definition of quality cannot be made, since different meanings can be assigned to this concept depending on the context and content in which it is used, it is mainly associated with meeting customer needs and expectations, fitness for use, and freedom from non-conformances to achieve superiority to competitors.

A. SIX SIGMA: STATISTICAL DEFINITION

It is a well-known fact that "Six Sigma statistic measures the capability of the process to perform defect-free work" (Jackson, 2006). Assuming that a typical process is likely to "deviate from its natural centering conditions by approximately 1.5 standard deviations at any given moment" in time such that the mean no longer equals the target, the tolerance limits are set to $\pm 6\delta$ for a Six Sigma process ("What is Six Sigma," 2015). That means that the edge of the process distribution ends at $\pm 4.5\delta$ from the shifted process mean. Figure 1 displays short-term performance of a single Critical-to-Quality (CTQ) characteristic when the Six Sigma process is centered, while Figure 2 illustrates the long-term performance of the same process, which shows 1.5 sigma shifts after the influence of process factors such as tool wear, machine set-up, and operators.

The capability of a process refers to its performance when it is operating in control. It is usually expressed in terms of a process capability ratio (Cp), as shown in the following equation:

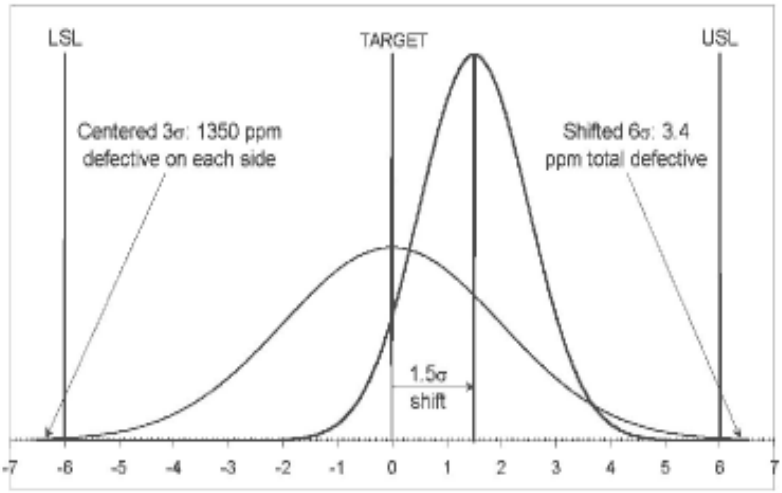
$$Cp = \left(\frac{USL - LSL}{6\delta} \right)$$

Equation (2.1)

The definition of the Cp given by Equation (2.1) assumes that the process is centered (see Figure 1). If the process is off-centered (see Figure 2), then the actual

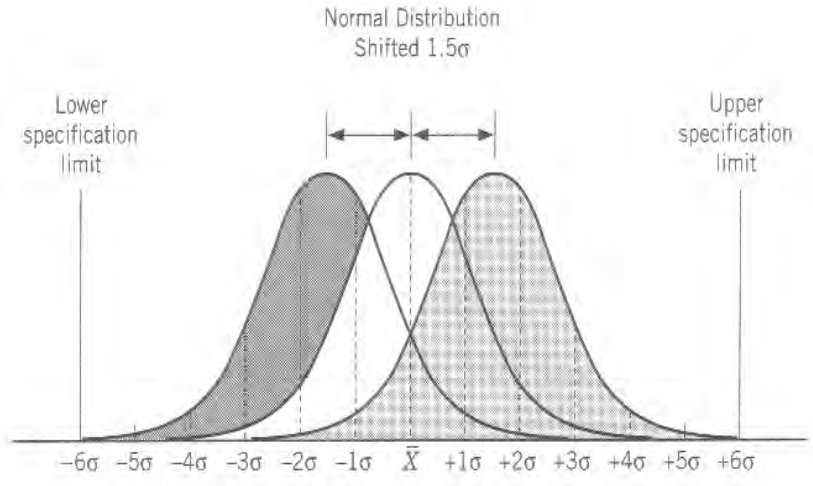
capability will be less than indicated by Cp, known as a measure of potential capability, and is measured by Cpk as shown in Equation (2.2):

Figure 1. A Centered Process ($Cp = 2,\ Cpk = 2$)



Source: Ramberg, J. A. (n.d.), Six Sigma: Fad or fundamental?, retrieved June 14, 2015, from http://www.qualitydigest.com/may00/html/sixsigmapro.html

Figure 2. A 1.5 Sigma Off-Centered Process ($Cp = 2,\ Cpk = 1.5$)



Source: Wu, Y., (n.d.), Six sigma programs, retrieved June 14, 2015, from http://www.public.iastate.edu/~vardeman/IE361/s00mini/wu2.htm

$$Cpk = \min\left(\frac{(USL-\mu)-(LSL-\mu)}{3\delta}\right)$$

Equation (2.2)

As seen in Equation (2.2), Cpk is a "one-sided process capability ratio calculated relative to the specification limit nearest to the process mean" ("Process Capability Index," 2015). Thus, a Six Sigma process corresponds to the capability indices $Cp = 2$, $Cpk = 1.5$ after the shift. Assuming a normally distributed process, the defect rate increases from 0.002 ppm (parts per million) to 3.4 ppm. Consequently, the mean of a Six Sigma process can shift 1.5 standard deviations from the center of the specifications and still maintain a fallout of 3.4 parts per million. This number of defectives corresponds to a yield rate of 99.9997 per cent. Table 1 (Tadikamala, 1994) shows "the number of defects of a process as a function of the sigma value of the process (e.g., 6δ) and the off-centering value of the process (e.g., 0 or 1.5δ)." Thus, the sigma value of a process or represents the number of defectives of that process, therefore, describes its quality level. The higher the process sigma value, the less likely a process will produce defects.

One should be cautious about using the Six Sigma concept because the defect rates and the process capability indices discussed are based on the assumption that "the underlying process distribution is approximately bell shaped or normal, yet in some situations, the distribution may not be normal" (Khlebnikova, 2012). For example, such distributions related to flatness, pull strength, and waiting time might naturally follow a skewed structure. In such cases, calculating Cpk and defect rates in the usual way might be misleading. Thus, a basic restriction of Six Sigma concept is that the actual process distribution is usually unknown.

If a process shifts at all, it might be out of statistical control. The shift can signal an out-of-control situation due to the presence of special (assignable) causes. Changing solely the tolerance limits does not correct this situation. In such cases, the meaning of defect rates and Cpk are unclear.

Table 1. The Number of Defectives (Pans Per Million, or ppm) for Specified Off-Centering of the Process and Quality Levels

Sigma level without 1.5 σ shift	DPMO without 1.5 σ shift	Sigma level with 1.5 σ shift	DPMO with 1.5 σ shift
1.0	317,311	1.0	697,672
1.5	133,614	1.5	501,350
2.0	45,500	2.0	308,770
2.5	12,419	2.5	158,687
3.0	2,700	3.0	66,811
3.5	465.35	3.5	22,750
4.0	63.37	4.0	6,210
4.5	6.80	4.5	1,350
5.0	0.574	5.0	232.67
5.5	0.038	5.5	31.69
6.0	**0.002**	**6.0**	**3.40**

Source: Free Six Sigma Tools, (n.d.), retrieved October 23, 2015, from https://www.leansigmacorporation.com/tools/#lightbox/11/

It is important to remember that defining performance in terms of ppm metric is not required for every sub-step of every process, product or service. Ppm metrics should be used when process performance quantitatively drives the end result of customer satisfaction or profitability.

The objective of Six Sigma can also be expressed as minimizing Cost of Poor Quality (COPQ) using Critical to Quality (CTQ) variables. COPQ "consists of all costs that would disappear if there were no errors, rework or field failures" (Juran & Godfrey, 1999). COPQ includes more generally

> the cost involved in fulfilling the gap between the desired and actual product/service quality, also the cost of lost opportunity due to the loss of resources used in rectifying the defect. It is calculated from identifying all costs during management activities in quantitative manner and setting up a plan to save them. (Han & Lee, 2002).

Labor cost to fix the problem, rework cost, disposition costs, cost of extra material and utilities used, also "loss of sales/revenue (profit margin), potential loss of market share, lower service level to customers/consumers are examples of such costs, but COPQ does not include detection and prevention cost" (Juran's Quality Handbook, 1999). Although

visible costs can be estimated, the hidden costs associated with defects and errors that include costs related to configuration change, longer process duration, over-quality, creation arrangement change, operation expense increment, revenue decrease, and brand image damage is not included in the visible low quality cost (Han & Lee, 2002).

Critical-to-Quality variables (CTQ) can be defined as "the key measurable characteristics of a product or process whose performance standards or specification limits must be met in order to satisfy the customers" ("CTQ Tree," 2015). CTQs "represent the product or service characteristics that are defined by either internal or external customers" and are the subject of the improvement project ("CTQ Tree," 2015). They are the main factors for COPQ. In other words, the critical elements for the quality of the target system, thus qualitative customer needs should be translated into critical-to-satisfaction (CTS) characteristics, which can be expressed in terms of either critical to quality, delivery or cost (CTQ, CTD, CTC) such that actionable and quantitative business specifications are identified. Harry (1997) defines the product is a function as "the design and the manufacturing process which is represented as $Y = f(x)$, where Y is characterized as dependent (output) variables, and its role as to be monitored, while the X is described as independent (input) variables, and its role as to be controlled." The emphasis has to shift from monitoring Y to controlling the relevant Xs (Harry, 1997).

B. SIX SIGMA PROGRAM: DEFINITION AND INTERPRETATIONS

Six Sigma is a results-oriented, project-focused approach to quality. It has elements of Edwards Deming's management and quality philosophy, but its tools are not new. Rather, it is a clever compilation of proven techniques. It has been described and interpreted in a variety of ways. Pande et al. (2000) define Six Sigma as "a comprehensive and flexible system for achieving, sustaining, and maximizing business success." They list its major characteristics as a "close understanding of customer needs; disciplined use of facts, data, and statistical analysis; and diligent attention to managing, improving, and reinventing business processes." It is a disciplined and "data-driven approach to analyzing statistically the root causes of business problems and solving them" (Blakeslee, 1999; Hahn, Doganaksoy, & Hoerl, 2000). By implementing this

company-wide quality improvement, daily activities can be designed and monitored so that wastes are minimized while resources are optimized and customer satisfaction is increased. Six Sigma is also defined as "a management philosophy, non-conformance measure and problem-solving methodology for improving a business" (McAdam & Evans, 2004).

These definitions and many others underline a customer-driven approach. They emphasize reducing costs of poor quality and wastes, improving effectiveness and efficiency, reducing cycle time, and maximizing profitability. Yet, perhaps its most important characteristic is that decision-making and improvement processes are based on quantitative facts or data, rather than emotional, abstract, or subjective discussion (Antony & Banuelas, 2001; de Mast, Schippers, Does, & van den Heuvel, 2000; Han & Lee, 2002; Juran & De Feo, 1999; Pande et al., 2000). Integrating the data-driven approach in the culture of an enterprise is the main objective of Six Sigma.

A final interpretation of Six Sigma is from process systems engineers who describe it as "enterprise-wide off-line activities that require accurate and sufficient amount of data, statistical knowledge, teams of experts or consultants for setting goals and checking progresses at each implementation step and active participation of all the members" (Han and Lee, 2002).

C. HISTORY AND EVOLUTION OF SIX SIGMA

Six Sigma initiatives were originally developed by Motorola in the 1980s to improve the performance of the company. Implementing these ideas helped Motorola win its first Malcolm Baldrige National Quality Award in 1998. Then numerous big corporations such as GE, Honeywell, Dow Chemical, Sony, Johnson & Johnson, Bombardier Aerospace, and DuPont have implemented Six Sigma. As these other leading companies added their own variations to the ideas developed by Motorola, Six Sigma has turned into a restrained, quantitative methodology for enhancing operations in a wide range of industry and business capacities. Simultaneously, the number of discussions—spanning various types of media, from web pages to academic papers—has rapidly increased. (Hahn, Hill, Hoerl, & Zinkgraf, 1999).

D. SIX SIGMA AS A STRUCTURED IMPROVEMENT METHODOLOGY: DEFINE-MEASURE ANALYZE-IMPROVE-CONTROL (DMAIC)

Six-Sigma is a problem-solving methodology that follows the Define, Measure, Analyze, Improve and Control (DMAIC) cycle based on the Edwards Deming's ("Deming Cycle," 2015) famous four-step Plan-Do-Check-Act (PDCA) cycle outlined below:

- Plan (P): *Plan what to do*. Process description, goals, priorities, performance indicators.
- Do (D): *Do it*. Apply the plan and obtain the results.
- Check (C): *Check* results through tracking indicators and identify any problems.
- Act (A): *Take action* to eliminate identified problems, and standardize the process if results are satisfactory.

The objectives of the five phases and key points can be briefly summarized as follows (Pande et al., 2000):

Define (D): In this phase, the core processes, the key customers and their requirements are identified. Then critical-to-quality characteristics are defined accordingly. Project goals and boundaries are set based on an organization's business goals and broad customer requirements are translated into specific CTQ requirements.

Goal theory suggests that "specific goals result in higher levels of performance than vague non-quantitative goals such as do-best goals" (Locke & Latham, 2002). The center piece of Six Sigma is a clear goal, although that goal can be extremely challenging. Furthermore, specific goals also reduce performance variance. Thus, it is of critical importance that the scope of the project is very clearly defined in order to optimize the potential of the team. The full scope of the problem should be clearly understood by every team member. On the other hand, the common mistake of executing the Define phase very quickly should be avoided.

Measure (M): The objective of this phase is to locate the source of the problems as precisely as possible, to measure current performance and to collect data (see Figure 3). CTQ characteristics "should be operationalized and its performance on the sigma

scale of quality [should] be defined" (Pande *et al*., 2000). The knowledge collected based on data helps narrow the range of potential causes so they may be explored in the Analyze phase.

Since data collected in this step will eventually be used to analyze the problem, it is of critical importance that data collection systems should be tested to ensure accuracy and consistency via studies like gage repeatability and reproducibility analysis.

Analyze (A): The question to be answered in this phase is which vital few process and input variables affect CTQ process performance or output variables. The key variables that are well on the way to make process variety in the CTQ are explored. (Pande *et al*., 2000). By the end of this step, data that verifying which potential causes actually contribute to the problem should be obtained. Figure 3 shows these different data types.

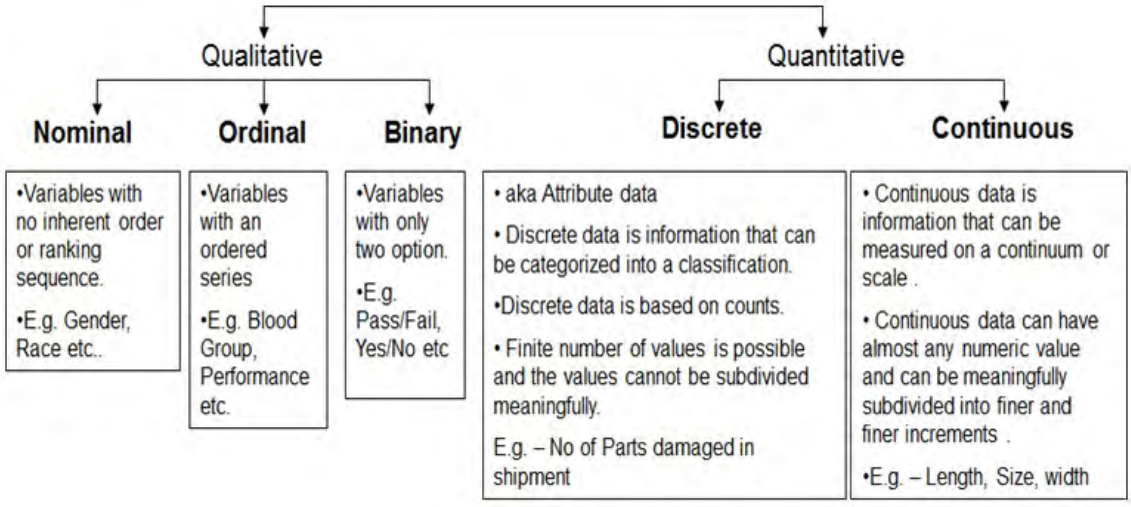
Improve (I): In this stage, the objective is to remove the causes of the defects. Pande et al. (2000), explain "[t]he vital few variables which govern the CTQ's performance are surfaced so that with this knowledge, operating limits for the leverage variables can be established." This phase develops the action plan to implement and evaluate solutions targeted at verified causes. After quantifying their effects on the CTQs, "the maximum acceptable ranges of the confirmed key variables are identified and a system for measuring deviations of the variables is validated" (Pande *et al*., 2000). t is demonstrated, with data, that implemented solutions solve the problem and lead to improvement

Control (C): The Control phase "verifies that the improvements are in place." Team members should be able to answer the question "How can we make the process stay fixed?" This step should ensure a control scheme for the vital few variables.

Control is a very important phase in the DMAIC process since it will determine whether the improvement continues in the future. Effective control systems should be in place to keep the process in control. Either simple or complex, they should become part of the overall quality system to monitor implemented solutions.

The power of Six Sigma comes from the compilation of proven problem solving tools and techniques. The DMAIC cycle depends on a wide range of statistical and qualitative (managerial) tools. The strength comes from consciously and methodically deploying these tools in a way that achieves business goals, as a result, customer satisfaction. Figure 4 illustrates many of these tools, and where they fall within the DMAIC framework. One can notice that any of these tools are already well known and not new. With its methodological or structured approach, the DMAIC cycle offers an organized and rational way to problem solving, and guides team members along the improvement efforts.

Figure 3. Six Sigma Data Types



Source: Six Sigma DMAIC process, (n.d.), in *International Six Sigma Institute*, retrieved October 23, 2015, from http://www.sixsigmainstitute.org/Six_Sigma_DMAIC_Process_ Measure_ Phase_Types_Of_Data.php

Figure 4. Six Sigma Improvement Framework

Source: Chugh, R., (2009, November 19), Six Sigma process flow [Web log post], retrieved from http://sixsigmaworld.blogspot.com/2009_11_01_archive.html

E. SIX SIGMA AS A QUALITY/PROCESS IMPROVEMENT STRATEGY

In the aggressive business environment of the twenty-first century, quality improvement procedures have come to play an important part in industry (Juran & De Feo, 1999). In this context, "improvement" is defined as "the organized creation of beneficial change; the attainment of unprecedented levels of performance," whose synonym can be stated as "breakthrough" (Juran & De Feo, 1999). These quality improvement strategies often rely heavily on statistical techniques. Six Sigma is one of these strategies that, in each step, uses appropriate tools in a structured way.

Normally, quality improvement projects happen venture by undertaking. It is distinguished from quality control, "which is an on-line process reactive in nature, by its proactive and project wise nature" (De Mast, 2003). Quality improvement projects rely on empirical inquiry; hence statistical methods are applied in this context for problem solving and fixing results.

A quality improvement strategy can be defined as "a coherent series of concepts, steps (phases), methodological rules, and tools that guide a quality professional in bringing the quality of a process or product to unprecedented levels" (de Mast, 2003). Montgomery (2001) and Hoerl and Snee (2002) state that

> it is statistical if the relations between the quality characteristic under study and influence factors in the process are to be discovered; improvement actions are derived from these relations; and conjectured relations are accepted as true after they are tested against empirical data. Thus, empirical inquiry is a must for qualifying a quality improvement strategy as statistical. (pp. 317–326)

The Six Sigma program suggests a wide collection of tools and techniques in each step of the methodology. It also suggests empirical inquiry and the use of "statistical science is a common thread through the phases of the methodology" (Montgomery, 2001; Hoerl & Snee, 2002). Six Sigma's goal of "improving the performance of a process by identifying the causes of variation, eliminating them and generating improvement actions" is a common objective of process improvement strategies (De Mast *et al*., 2000). Thus, when combined with its statistics-based problem solving approach, Six Sigma can be qualified as a 'statistical quality improvement strategy'.

Quality improvement should be directed and built into the system. The key for Six Sigma is to weave it thoroughly into all areas from business operations to factory processes. Having improvement projects in different areas will ensure the widespread, rapid propagation of Six Sigma. On the other hand, confining projects to a single area (e.g., to manufacturing) will cause failure by restricting Six Sigma across functions.

One of the basic concepts in quality improvement is that it extends to all parameters. "Published reports of quality improvements show that the effects have extended to all parameters such as productivity, cycle time, human safety, and environment" (Juran & Godfrey, 1999). Six Sigma's quality improvement program can provide benefits across multi-parameters, but the usage of a single quality criterion can restrict multi-parameter optimization. Another basic concept in quality improvement is that some vital few parameters bring major gains. Such projects need multifunctional teams to carry them out because they are multifunctional in nature. The major Six Sigma

improvements can be similarly obtained by projects focused at the vital few critical-to-quality parameters and driven by multifunctional teams.

The common belief that "higher quality costs more" inhibits quality improvement. When higher quality means improved product features, and capital investment and product development are required, it does cost more. However, when it means lower chronic waste, higher quality costs less. As Six Sigma targets reduced process variations with lower chronic waste and attempts to eliminate potential problems, rather than fixing problems after they occur, it can create higher quality products at reduced costs. However, initial investments in training, personnel allocation, and other opportunity costs are not included in this comparison.

Quality improvement does not only affect business processes. Changes in a company's way of life are necessary when it has undergone quality improvement efforts. In *Juran's Quality Handbook* (Juran & Godfrey, 1999), that change is described as "a mega-change that disturbs the peace and breeds many unwanted side effects." Changes in job descriptions mean new responsibilities and extra work for many employees. Some employees resist this change because they perceive it as a threat to their jobs and/or status. There are major changes associated with implementing Six Sigma initiatives, including organizational restructuring, creation of new roles (such as black belts and green belts), and developing multifunctional teams. As a consequence, the alarming impact of these changes may bring about great resistance. Implementing Six Sigma is, however, essential to remaining competitive, so it is important to persevere despite these challenges.

F. SIX SIGMA: SUCCESS DRIVING ELEMENTS AND CLAIMED DIFFERENCES

While Six Sigma has been criticized by many as being nothing more than a marketing scheme, many others claim that it differs from other quality improvement strategies in many ways. During our research on this topic, we came across the following important factors that set it apart.

1. Leadership Commitment and Top-Down Initiation of the Implementation

Leadership is a big issue in Six Sigma implementation. Active involvement of top management and passionate leadership is indispensable in achieving Six Sigma objectives. Employees must perceive active leadership from top-down administration in implementing the initiatives.

One noticeable difference in a Six Sigma management philosophy, which is also one of the major reasons for Six Sigma success, "is the high level of upper management involvement and commitment" as opposed to previous quality efforts that emphasized methodology or tactics (Eckes, 2003; Goh, 2002; Montgomery, 2001). As top management is able to measure financial results accruing from Six Sigma, it becomes easier to commit the necessary resources required for sustaining the program.

Strong leaders are key to the success of Six Sigma and are assigned important responsibilities from the beginning. Top management should set up short-term and long-term Six Sigma business objectives for the organization. Pande et al. (2000) list some of these responsibilities:

- establishing the infrastructure of Six Sigma initiatives
- allocating the resources for Six Sigma projects
- reviewing the progress of various projects and providing the needed support
- negotiating the cross-functional teams to accomplish Six Sigma projects
- monitoring the personnel training

2. A Structured Organizational Workforce Infrastructure

Montgomery (2001) states that among the top reasons for Six Sigma's success is the organizational infrastructure consisting of "green belts, black belts, master black belts, and champions [which are] very effective at identifying problems, then putting teams together to solve them." The hierarchy of expertise and execution is also one of the critical factors that contributes to the potential of Six Sigma (Goh, 2002). Another difference from other quality improvement strategies is the assignment of full-time staff.

Six Sigma recognizes that the managerial and organizational aspects are at least as important as the technical strategies. Another strength comes from allocating the best people to Six Sigma jobs and providing them with carefully designed training to guide their projects. By defining the responsibilities of each stakeholder and team member at the beginning, Six Sigma attacks projects efficiently.

3. A Disciplined Approach to Process Management and Structured Deployment of Tools

Six Sigma also succeeds because of its disciplined approach known as DMAIC framework, where techniques are integrated into a logical flow (Goh, 2002; Pande et al., 2000). Researchers propose two major claims. First, although quality management and statistical methodologies are not "novel in concept and application, their integration into a DMAIC framework," which offers "an effective problem identification and solution framework, has greatly facilitated their understanding, learning, and deployment by practitioners" (Goh & Xie, 2004). Second, with its disciplined approach, Six Sigma claims to provide a common language, roadmaps, sequences, and tools that guide people through their projects providing them a common thought process so that the power of the tools can be leveraged to achieve significant tangible business results (Hahn et al., 2000; Snee, 1999).

4. Customer-Driven Approach

It is generally accepted that one of the major benefits of Six Sigma implementation is the increase in customer satisfaction. Six Sigma recognizes the customers of the process under investigation and defines expected customer benefits from the beginning.

Due to Six Sigma's focus on customers, success is measured by meeting customer expectations, improvements are defined by their impact on customer satisfaction, and consideration is given to the dynamic nature of customer needs (Pande et al., 2000). This is just the contrary of an inward-looking standardization (Goh, 2002).

5. Clear Performance Metrics (Sigma Levels, Defects per Million Opportunities)

Organizations establish "clear performance metrics for each improvement in costs, quality, yields, and capacity improvements" (Juran & De Feo, 1999). Metrics allow team members to keep projects focused on goals and objectives and to take corrective actions quickly to avert defects or damage.

6. Fact- and Data-Based Decisions

Perhaps the major reason for Six Sigma's success is that all decision-making processes are based on quantitative facts or data, rather than emotional, abstract, or subjective discussion (de Mast et al., 2000; Han & Lee, 2002). Decisions are not based on procedure or judgment, and "the use of statistical thinking is a common thread through the phases" (Goh, 2002; Hoerl & Snee, 2002). Thus, Six Sigma can be defined as "a disciplined method of using extremely rigorous data gathering and statistical analysis to pinpoint sources of errors and ways of eliminating them" (Harry & Schroeder, 2000).

The strategy emphasizes data-driven practices. In his editorial "Beyond Six Sigma," Montgomery (2001) argues that, unlike TQM and other management programs such as Business Process Engineering, Value Engineering, and Zero Defects, Six Sigma actually works since it is based on sound statistical science. Data and analysis are the primary means of understanding key variables to optimize results. "Common sense" decision-making is avoided, and instead, knowledge is extracted based on data and used in decision-making.

7. Result-Oriented Approach

Project-by-project implementation instead of "quality free concept" and crucial project orientation also distinguish Six Sigma from other quality improvement procedures (Goh, 2002; Montgomery, 2001). The progress of projects and of implemented solutions is regularly monitored. One of the main project assessment criteria considers whether results are worth the investment. Furthermore, managers consider how quickly results will be evident, and potential projects are evaluated for their doability in limited time periods, often in two to six months. These standards make progress tangible.

8. Business-Oriented Approach

In his editorial, "Beyond Six Sigma," Montgomery (2001) says that the main reason Six Sigma has been successful, even though its predecessors (such as TQM) are dead, is that it focuses on achieving business goals. Determining "what measures are key to gauging business performance" is the initial step in Six Sigma discipline (Pande et al., 2000). Alignment with business priorities shapes projects goals and their contents.

Pande et al. (2000) state that business orientation also requires a proactive management so that "an organization is dynamic and quick-responsive to disturbances, which are not deterministic functions of time, rather exhibit random fluctuations." This requires that ambitious goals are made and reviewed frequently, that clear strategic priorities are established, and that problem prevention mechanisms are in place. Reactive habits should be replaced by a proactive style of management to facilitate competitive advantages. As a business-oriented approach, Six Sigma introduces a proactive management into the corporation dynamics (Pande et al., 2000).

9. Intensive Training

The training for Six Sigma staff is extensive, usually four or five weeks of intensive, highly-quantitative training. Detailed training and certification, "in contrast to the ad hoc or one-off nature of on-the-job training in the past, [is] offered to the employees" (Goh, 2002). Furthermore, shaping the training curriculums to the needs of employees and providing one-on-one coaching also contributes to Six Sigma's success in achieving goals.

In addition to these characteristics, Six Sigma's wide range of applicability, in transactional, commercial, and manufacturing operations, renders a "new dimension to service sector quality in terms of rigor of problem solving and performance improvement" (de Mast et al., 2000; Goh, 2002; Pande et al., 2000).

G. LEAN PRODUCTION

Dennis (2002) defines Lean production as a "set of principles and tools that helps us eliminate process activities that do not add value, and create low in a process." Lean

production can also be defined as a management ideology mainly focusing on reduction of eight different wastes in processes: "human talent, over-production, waiting time, transportation, processing, inventory, motion, and scrap" ("Lean Manufacturing," 2015). According to Levinson (2002), origins of Lean production can be traced to the scientific management principles of Frederic Taylor (1911) and to the practical genius of Henry Ford.

But the principles of Lean production were more fully embodied in its recent incarnations: Just in Time Systems and Toyota Production System (Ohno, 1988). According to Apte and Kang (2006) determination of the value lies in the center of Lean production. Value can be defined as the feature, importance, or worth of something which a customer is willing to pay. In a production line the processes which do not add value to the whole production are also defined as waste. Therefore, we use Lean production, or Lean framework, as a tool to identify the processes which add value or to identify and eliminate non-value added processes (Apte & Kang, 2006). In summary, according to Apte and Kang (2006), Lean manufacturing

- focuses on maximizing process velocity
- provides tools for analyzing process flow and delay times at each activity in a process
- emphasizes Value-stream Mapping which centers on the separation of value added from non-value added work with tools to eliminate the root causes of non-valued activities and their cost
- recognizes and attempts to eliminate 8 types of waste/non-value added work: defects, inventory, overproduction, waiting time, motion, transportation, processing, and human talent
- creates workplace organization through Five S methodology consisting of sort, straighten, sustain, sweep, and standardize

H. LEAN SIX SIGMA

The two well-known process improvement techniques, Six Sigma and Lean production, have been used separately for many years. However, in recent years, practitioners realized that the two process improvement methodologies achieve greater success when used together (Apte & Kang, 2006).

According to Apte and Kang (2006, pp. 15–16),

Lean and Six Sigma approaches have their own strengths and weaknesses the specific action plan to be followed in effectively implementing Lean Six Sigma (for example, Lean first followed by Six Sigma later or vice versa) is dependent on the nature of the situation at hand.

Furthermore, Apte and Kang (2006, pp. 15–16), suggest that

the problems related to accuracy and/or completeness are usually addressed best by the tools of Six Sigma; consequently, those tools should be introduced first. However, if the customer needs quick results, and if the problem is related to timeliness or productivity, Lean should be implemented first with an understanding that deep and complex problems will be solved only by the subsequent use of the Six Sigma tools.

In summary, Apte and Kang (2006, p. 16) indicate that

Lean and Six Sigma are rich bodies of knowledge and are mature methodologies for solving a broad variety of process-related problems. Each methodology has its own approach to process improvement and its own tool set al.though Lean and Six Sigma methodologies can be mastered independently, they can and should be implemented together to realize the full benefits of process improvements by any organization.

III. EXAMPLES OF LEAN SIX SIGMA IMPLEMENTATION IN THE MILITARY

With its high profile adoption by industry giants such as General Electric, Motorola, Honeywell (formerly, Allied Signal), and Raytheon Corporation, business has witnessed many other big corporations claiming notable successes from the Lean Six Sigma methodology. According to Apte and Kang (2006, p. 17),

> the success realized by top companies such as Toyota and GE has inspired the use of Lean Six Sigma in the U.S. Department of Defense (DOD). Although the DOD has implemented a number of process improvement methodologies with varying degrees of success in the past decade, it has begun to explore the potential of implementing Lean Six Sigma throughout the entire DOD only recently.

When we look at the promising results of these Lean Six Sigma implementations made by the U.S. DOD, the benefits of implementing similar programs in military organizations around the world are evident. Apte and Kang (2006) state in their research that

> as the lean Six Sigma mindset continues to grow among the DOD community and both the Lean and Six Sigma practices become more commonplace, the equipment and personnel available to the DOD will provide considerably more capability per taxpayer dollar than ever before.

A. ARMY IMPLEMENTATIONS

In their research about Lean Six Sigma for Reduced Cycle Costs and Improved Readiness, Apte and Kang (2006) detailed successful implementations of Lean Six Sigma in the United States Army:

- In implementing Lean Six Sigma, the Red River [Army] Depot [Repair Facility] has made many changes to its HMMWV repair line, such as: forming an assembly-line process, using time-managed intervals to control the flow of work, organizing employees based on experience and proficiency, cleaning up and improving the overall work environment, stocking more and better quality parts to reduce stock-outs, and training employees to ensure there is no break in continuity on the assembly line. Improvement efforts have resulted in the ability to turn out 32 mission-ready HMMWV's a day, compared with three a week in 2004. The Lean process has also lowered the cost of repair for one vehicle from $89,000 to

$48,000. Some of the biggest improvement ideas have come from the front-line employees themselves.

- Pine Bluff Arsenal in Arkansas reduced its repair recycle time by about 90% and increased its production rate by about 50% on M-40 protective gas masks.

- Letterkenny Army Depot in Pennsylvania has saved $11.9 million in the cost of building the Patriot air-defense missile system. In the Corpus Christi Army Depot, the overhaul time for one T700 helicopter engine was reduced by 64%. The depots improved the consistency of their repair operations by increasing the mean time between the engine overhauls from 309 hours to over 900 hours and improved the return to field accuracy to above 90%.

B. NAVY IMPLEMENTATION

Implementation of Lean Six Sigma by the U.S. Navy is called the AIRSpeed program. Secretary of the Navy Donald Winter stated in 2006,

> Lean Six Sigma (LSS) is a proven business process that several elements of the Navy and Marine Corps have initiated including training over 500 Black Belts and 1500 Green Belts who have facilitated 2800 events and projects. These activities have averaged a 4:1 return on investment.

In their research, Apte and Kang (2006) give examples of Lean Six Sigma implementations in the U.S. Navy:

- In October 2005, Naval Air Warfare Center (NAWC) accounting practices yielded an annual savings of $176.9K with an additional anticipated saving of $146.3K in waste elimination.

- Since April 2004, Aviation Intermediate Maintenance Division (AIMD) Whidbey Island reduced J-52 aircraft engine repair time from 468 hours to 233 hours and reported significant inventory and operating cost savings. Since February 2006, AIMD Patuxent River has seen increased savings due to a 10% inventory reduction and a reallocation of 166 hours of full-time employees.

- In June 2006, Naval Aviation Systems Command's (NAVAIR) PMA offices began replicating successes of other PMA offices, including one office that saw an estimated $163K/year savings due to reducing processing time from 240 days average to a predicted average of 15 days.

In their research Apte and Kang (2006, p.19) state that "the successes are due, in large part, to the training received by the employees that emphasizes the use of DMAIC

(Define, Measure, Analysis, Improve and Control) methodology for process improvement." According to the AIRSpeed program, there are five anticipated long-term benefits of implementing Lean Six Sigma methodology in the U.S. Navy (Apte & Kang 2006), these are:

- Reduce total cost of Naval Aviation by reducing inventory, manpower and operating expenses.
- Support the Fleet Response Plan by providing aircraft Ready for Tasking (RFT).
- Integrate Maintenance and Supply Support System to provide seamless support to the Fleet.
- Improve logistics and maintenance response by reducing cycle-time and the logistics footprint.
- Place ownership and accountability at the appropriate levels.

C. AIR FORCE IMPLEMENTATIONS

In their research about Lean Six Sigma for Reduced Cycle Costs and Improved Readiness, Apte and Kang (2006) state that "over the next several years, the Air Force (AF) is expected to lose approximately 40,000 personnel. This loss of manpower means airmen must work smarter and leaner. Senior AF leadership has decided to utilize the Lean Six Sigma strategy to accomplish this." The U.S. Air Force created a new program office called Air Force Smart Operations 21 (AFSO21) at the Pentagon with Brig. Gen. S. Taco Gilbert as the director of the AFSO21 Office (Apte & Kang, 2006).

As Apte and Kang (2006, p. 20) mention in their paper,

> the AF already has several examples of AFSO21 at work. AF Materiel Command has applied AFSO21 and returned 100 aircraft to duty, as well as reduced C-5 maintenance time by 50%. USAF Europe (USAFE) applied AFSO21 practices—they reduced the number of telephone operators by approximately 16% and saved the command $2.4 million (Lopez, 2006). The AF has also begun implementation of Lean Six Sigma concepts to their contracting activities. The goal is to reduce the cycle-time required to award a contract in support of new operational requirements. The Global Hawk team followed the Lean Thinking concepts to break down the contracting process into a value stream. They identified steps that do not add value and eliminated them. By eliminating

those unnecessary steps, their three process times were cut by 37%, 40%, and 73%.

IV. CULTURAL DISTANCE

Because Lean Six Sigma is about organizational improvement, mainly focusing on process improvement and management, it is also about people's behavior. These two behaviors cannot be separated. Therefore, how various differences in national culture can affect Six Sigma implementations appears to be a logical question in the minds of possible Lean Six Sigma practitioners. In order to analyze the possible effects of national cultural differences in management based topics, especially in international management issues, using the Hofstede's cultural dimensions theory may help to better understand or at least predict what might be the future implications of a project. Hofstede's cultural dimensions theory is "a framework for cross-cultural communication," developed by Geert Hofstede. According to Geert Hofstede (as cited in The Hofstede's Center, 2015), it mainly describes "the effects of a society's culture on the values of its members, and how these values relate to behavior, using a structure derived from factor analysis." Professor Geert Hofstede (as cited in The Hofstede's Center, 2015) defines culture as "the collective programming of the mind distinguishing the members of one group or category of people from others."

Based on the model offered by Hofstede, national culture consists of six dimensions. According to Hofstede,

> the cultural dimensions represent independent preferences for one state of affairs over another that distinguish countries (rather than individuals) from each other. The country scores on the dimensions are relative, as we are all human and simultaneously we are all unique. In other words, culture can be only used meaningfully by comparison. ("National Culture," n.d.)

The six dimensions described in the model are Power Distant Index (PDI), Individualism Versus Collectivism (IDV), Masculinity Versus Femininity (MAS), Uncertainty Avoidance Index (UAI), Long Term Orientation Versus Short Term Normative Orientation (LTO), and Indulgence Versus Restraint (IND).

A. POWER DISTANCE INDEX (PDI)

According to Geert Hofstede (as cited in The Hofstede's Center, 2015), PDI

> expresses the degree to which the less powerful members of a society accept and expect that power is distributed unequally. The fundamental issue here is how a society handles inequalities among people. People in societies exhibiting a large degree of Power Distance accept a hierarchical order in which everybody has a place and which needs no further justification. In societies with low Power Distance, people strive to equalise the distribution of power and demand justification for inequalities of power. ("National Culture," n.d.)

B. INDIVIDUALISM VERSUS COLLECTIVISM (IDV)

According to Geert Hofstede (as cited in The Hofstede's Center, 2015),

> high side of this dimension, called individualism, can be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of only themselves and their immediate families. Its opposite, collectivism, represents a preference for a tightly-knit framework in society in which individuals can expect their relatives or members of a particular in-group to look after them in exchange for unquestioning loyalty. A society's position on this dimension is reflected in whether people's self-image is defined in terms of I or we. ("National Culture," n.d.)

C. MASCULINITY VERSUS FEMININITY (MAS)

According to Geert Hofstede (as cited in The Hofstede's Center, 2015) states

> the Masculinity side of this dimension represents a preference in society for achievement, heroism, assertiveness, and material rewards for success. Society at large is more competitive. Its opposite, femininity, stands for a preference for cooperation, modesty, caring for the weak, and quality of life. Society at large is more consensus-oriented. In the business context Masculinity versus Femininity is sometimes also related to as tough versus tender cultures. ("National Culture," n.d.)

D. UNCERTAINTY AVOIDANCE INDEX (UAI)

Geert Hofstede (as cited in The Hofstede's Center, 2015) defines UAI as

> the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity. The fundamental issue here is how a society deals with the fact that the future can never be known: should we try to control the future or just let it happen? Countries exhibiting strong UAI

> maintain rigid codes of belief and behaviour and are intolerant of unorthodox behaviour and ideas. Weak UAI societies maintain a more relaxed attitude in which practice counts more than principles. ("National Culture," n.d.)

E. LONG TERM ORIENTATION VERSUS SHORT TERM NORMATIVE ORIENTATION (LTO)

According to Geert Hofstede (as cited in The Hofstede's Center, 2015), "every society has to maintain some links with its own past while dealing with the challenges of the present and the future. Societies prioritize these two existential goals differently" ("National Culture," n.d.).

> Societies who score low on this dimension, for example, prefer to maintain time-honoured traditions and norms while viewing societal change with suspicion. Those with a culture which scores high, on the other hand, take a more pragmatic approach: they encourage thrift and efforts in modern education as a way to prepare for the future. ("National Culture," n.d.)

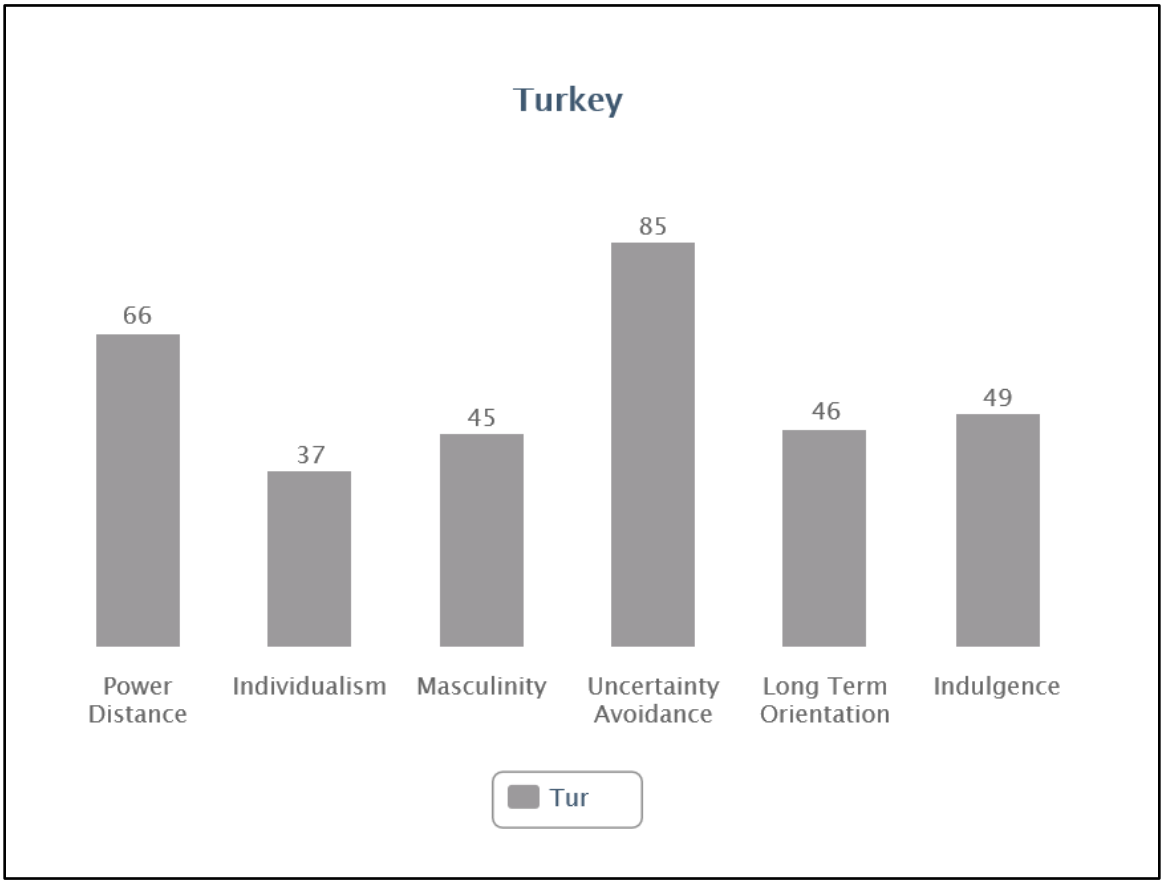
F. INDULGENCE VERSUS RESTRAINT (IND)

For the last dimension Hofstede (as cited in The Hofstede's Center, 2015) states,

> indulgence stands for a society that allows relatively free gratification of basic and natural human drives related to enjoying life and having fun. Restraint stands for a society that suppresses gratification of needs and regulates it by means of strict social norms. ("National Culture," n.d.)

By looking to the national scores (from 1 for the lowest to 120 for the highest), Hofstede's six-dimensions model allows us to make an international comparison between cultures, also called comparative research.

Figure 5. Turkey Country Comparison



Adapted from The Hoftstede Center, (n.d.), retrieved October 23, 2015, from http://geert-hofstede.com/turkey.html

According to the Hofstede Center, Turkey's scores for the six dimensions can be interpreted as follows:

1. Power Distance

Turkey scores high on this dimension (score of 66) which means that the following characterizes the Turkish style: Dependent, hierarchical, superiors often inaccessible and the ideal boss is a father figure. Power is centralized and managers rely on their bosses and on rules. Employees expect to be told what to do. Control is expected and attitude towards managers is formal. Communication is indirect and the information flow is selective. The same structure can be observed in the family unit, where the father is a kind of patriarch to whom others submit. ("What about Turkey," n.d.)

2. Individualism

Turkey, with a score of 37 is a collectivistic society. This means that the We is important, people belong to in-groups (families, clans, or organizations) who look after each other in exchange for loyalty. Communication is indirect and the harmony of the group has to be maintained, open conflicts are avoided. The relationship has a moral base, and this always has priority over task fulfillment. Time must be invested initially to establish a relationship of trust. Nepotism may be found more often. Feedback is always indirect, also in the business environment. ("What about Turkey," n.d.)

3. Masculinity

Turkey scores 45 and is on the Feminine side of the scale. This means that the softer aspects of culture such as leveling with others, consensus, sympathy for the underdog are valued and encouraged. Conflicts are avoided in private and work life and consensus at the end is important. Leisure time is important for Turks, it is the time when the whole family, clan, and friends come together to enjoy life. Status is shown, but this comes more out of the high PDI. ("What about Turkey," n.d.)

4. Uncertainty Avoidance

Turkey scores 85 on this dimension, and thus there is a huge need for laws and rules. In order to minimize anxiety, people make use of a lot of rituals. For foreigners they might seem religious, with the many references to Allah, but often they are just traditional social patterns, used in specific situations to ease tension. ("What about Turkey," n.d.)

5. Long Term Orientation

Turkey's intermediate score of 46 is in the middle of the scale, so no dominant cultural preference can be inferred. ("What about Turkey," n.d.)

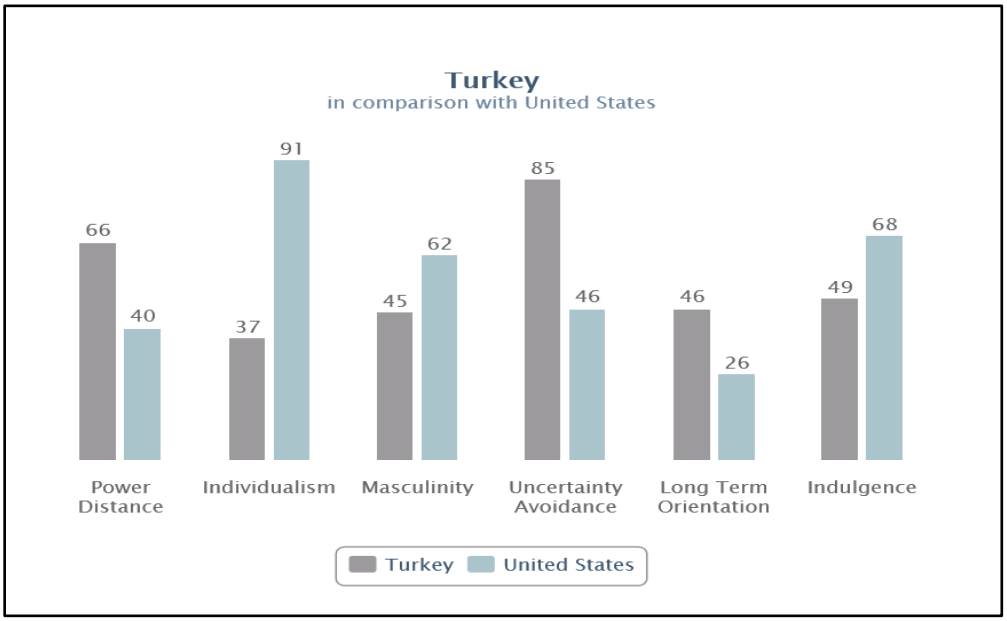
6. Indulgence

With an intermediate score of 49, a characteristic corresponding to this dimension cannot be determined for Turkey. ("What about Turkey," n.d.)

When we look at Turkey's scores for the six different dimensions, we see significant differences from the United States. Hofstede's cultural dimensions model may offer reasonable insight especially on management based topics. In implementing Lean Six Sigma in the Turkish army, project managers should bear in mind that the approach followed by the U.S. DOD for implementing a Lean Six Sigma project, may or may not

work for Turkey, due to significant cultural differences. Figure 6 demonstrates the differences between Turkey and the United States in Hoftsede's six cultural dimensions.

Figure 6. Turkey in Comparison with USA



Adapted from The Hoftstede Center, (n.d.), retrieved October 22, 2015, from http://geert-hofstede.com/turkey.html

By looking at the differences above, we can determine that Turkish and U.S. cultures differ significantly, and this conclusion may lead us to assume that a specific approach to implementing LSS in the United States may not work in Turkey if cultural differences are not taken into consideration.

Trompenaars and Hampden-Turner (1998) stress that during the implementation phase of a Lean Six Sigma project, one should pay attention to the cultural characteristics of that society "because the way organizations change [is] mostly influenced by their dominant culture."

Trompenaars and Hampden-Turner (1998) see "four primary organizational archetypes depending on the degree to which organizations are decentralized or centralized, informal or formal." Their research shows that the United States is "relatively

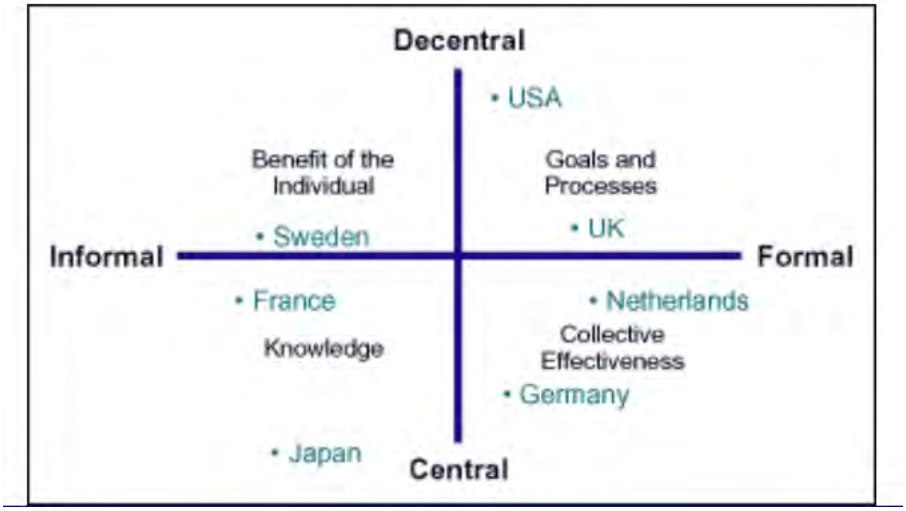
decentralized and formal in its approach to organizations." He further notes that U.S. culture "celebrates the achievement of individuals, and the result is a very receptive environment for Six Sigma—an approach to improving process performance based on competent individuals driving results."

With the findings from this study, we can say that like most of the Southern European countries (such as Italy and France), business organizations in Turkey are like families. Figure 7 shows different cultural perspectives on Six Sigma. As stated in "Using Six Sigma in Europe: A Cross-Cultural Perspective" (2014),

> Power for the good of the group is ascribed by virtue of knowledge. For senior managers to lead change in that context, they have to internalize, then personalize, the change for themselves and those for whom they feel responsible. In France, it means spending plenty of time educating senior managers about the leadership aspects of Six Sigma before ever picking process-based projects.

Since it is obvious from Figure 7 that Turkish and U.S. cultures lie in opposite zones, project managers who are implementing a Lean Six Sigma project in Turkey should structure projects in ways that appeal to Turkey's specific culture.

Figure 7. Six Sigma Cross Cultural Perspective



Source: "Using Six Sigma in Europe: A Cross-Cultural Perspective," (2014), retrieved October 23, 2015, from http://lean6sigma4all.eu/2014/12/07/using-six-sigma-in-europe-a-cross-cultural-perspective/

As Steve Crom (2015) states in his article,

> Six Sigma is universally applicable, though how one communicates the purpose of it and implements it should differ depending on the predominant national culture. Companies operating in Europe should beware of implementation approaches that are based on a U.S.-style emphasis on the capability of talented, well-trained individuals to get results no matter what it takes. CEOs should develop an explicit leadership strategy to introduce Six Sigma as a vehicle for strategic organizational change.

He continues, stating useful tips on implementing LSS across cultures:

> Years of experience have shown that the major Lean Six Sigma implementation challenges are people-related; therefore, it is important to bear in mind these pointers:

- Take stock early on of who is involved and how to motivate them to change.
- Be sure to incorporate soft skills training (e.g., facilitation and change management) in the Six Sigma curriculum.
- Train teams as well as individuals to build the capability of groups and their commitment to implement and sustain improvements.
- Be aware that teams from different countries will progress at different rates.
- To summarize, as Carey (2015) states in his article,

> While it is essential for a company to create familiarity with Lean and Six Sigma disciplines by training employees, it is even more important to integrate Lean Six Sigma into the company change culture. Lean Six Sigma should be a key component of the organization's change infrastructure supporting all projects and change initiatives from the ground up.

V. CHANGE MANAGEMENT AND LEAN SIX SIGMA

As discussed in the six sigma literature review, the lean six sigma method focuses on reducing the wastes and improving the quality of any kind of process. In this context, Juran and De Feo (1999, p. 76) defines "improvement" as "the organized creation of beneficial change; the attainment of unprecedented levels of performance." The beneficial change effects not only the processes, tools, practice techniques but also the employers and managers within the organization.

Kettinger and Grover (1995) argues that any continuous improvement approach like lean six sigma or another process change method aims to transform the current business. They also indicate that "business process change management" is critical to deploy this kind of systematic improvement methods. So for evaluating lean six sigma practicality and readiness level, we desired to inquire the relationship between lean six sigma and change management shortly in this section.

A. THE BASIS OF CHANGE MANAGEMENT

Change is emerging as a deep-rooted feature of any organization due to the technological advancements, developing knowledge workforce and new work processes (Burnes, 2004). Moreover the economic concerns, budget constraints, management policy shifting impose private and public organizations to consider organizational change as an urgent priority. Nevertheless, the complicated nature of change cause negative or positive effects on the organizational climate and also culture. Hence the change action should be managed effectively.

Although many organizations embrace the practice of change in some way, 70% of the change initiatives fail to accomplish intended objectives (Balogun & Hope Hailey, 2004). Dawson (1994) states that managing change will be one of the biggest challenges for modern organizations. The leaders should focus on managing change efficiently especially to direct their organizations towards an advantageous position in this very competitive business world.

Robbins and Judge (2011) articulate that organizations should adapt themselves to the shifting environment, demographic changes, new sourcing initiatives and new workforce. They also elaborate that rapid technology is persistently changing the job descriptions and the climate of the organization. As external effects like "economic shocks," "social trends," globalization and competition do not remain stagnant, the organizations should concentrate on managing change in order not to suffer from the negative effects of changing internal and external environment.

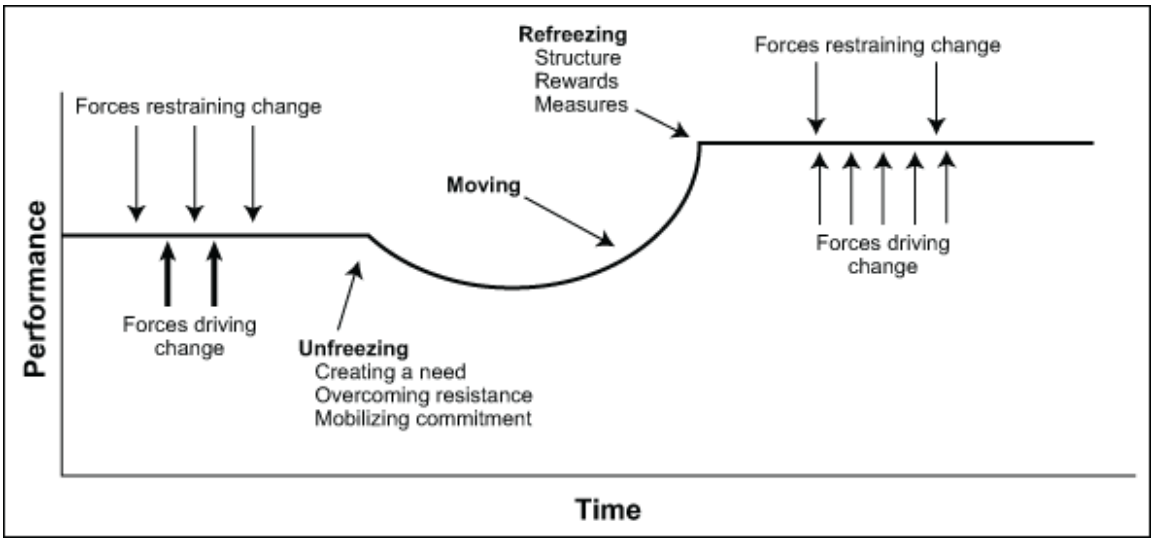
B. APPROACHES ON MANAGING ORGANIZATIONAL CHANGE

Robbins and Judge (2011, pp. 238–240) discusses three different approaches to successfully manage organizational change.

1. Lewin's Three-Step Model

In Figure 8, (as cited in Burnes, 2004) Kurt Lewin asserts that an organizational change occurs in three consecutive phases. The first step is "unfreezing" described as an equilibrium of resisting and supporting forces. It also includes the acceptance that the status-quo is not responding to the current problem that the organization should create a need to overcome resistance and mobilize commitment. The second step is the "movement" defined as the starting and practicing change initiative. And the third step is determined as "freezing" which depicts the efforts to sustain the change within the organization.

Figure 8. Lewin's Three-Step Change Model



Source: Thatte, D., & Khandelwal, N., (n.d.), Grabbing Hold of the GRPI Model, retrieved November 2, 2015, from http://www.isixsigma.com/implementation /teams/grabbing-hold-of-the-grpi-model/

2. Kotter's Eight-Step Plan for Implementing Change

John Kotter (1995, p. 99) elaborated on Lewin's model and created a more detailed plan for implementing change. Kotter focused on the possible problems while initiating and implementing change. He suggested some practical solutions to overcome the obstacles and reached the following eight steps:

- Establish a sense of urgency by creating a compelling reason for why change is needed.
- Form coalition with enough power to lead the change.
- Create a new vision to direct the change and strategies for achieving the vision.
- Communicate the vision throughout the organization.
- Empower others to act on the vision by removing barriers to change and encouraging risk taking and creative problem solving.
- Plan for, create, and reward short-term wins that move the organization toward the new vision

- Consolidate improvements, reassess changes, and make necessary adjustments in the new programs.
- Reinforce the changes by demonstrating the relationship between new behaviors and organizational success.

3. Organizational Development

Robbins and Judge (2011, pp. 239–240) defines organizational development (OD) as "A collection of change methods that try to improve organizational effectiveness and employee well-being." They contend that modern OD methods emphasizes human factors, collaborative and cooperative facets of the working environment. They underline five major efforts in OD:

- **Respect for people**. Individuals are perceived as responsible, conscientious and caring. They should be treated with dignity and respect
- **Trust and support**. An effective and healthy organization is characterized by trust, authenticity, openness, and a supportive climate.
- **Power equalization**. Effective organizations de-emphasize hierarchical authority and control.
- **Confrontation**. Problems should be openly confronted, not swept under the rug.
- **Participation**. The more engaged in the decisions they are, the more people are affected by a change will be committed to implementing them.

C. CHANGE MANAGEMENT WITHIN LEAN SIX SIGMA

The lean six sigma continuous improvement method brings some level of change not only to the work processes but also to the human side of the work and organization. The context of the change should be administered carefully while implementing the improvement method. LSS initiatives are more successful when they produce permanent change behavior by the effective practice of change management (Wilder, 2013). The change management deals with the potential resistance to change utilizing structured processes or tools for the desired outcomes of the project.

In Figure 9, Wilder (2013) offers the activities and deliverables of change management within the DMAIC cycle of an LSS project.

Figure 9. Change Management in DMAIC

Source: Wilder, B., (2013), All Aboard: Lean/Six Sigma is a journey best travelled with change management, *Plant Services Magazine*, 33(2), 38–42, retrieved November 2, 2015 from http://www.lce.com/All_Aboard_LeanSix_Sigma_is_a_journey_best_travelled_with_change_management_561-item.html

Cole (2008) suggests that the human side of change is very crucial for the success of DMAIC projects and any project influencing people need some level of change management. A green belt project potentially does not require comprehensive change management tools as much as a black belt project. He additionally argues that the integration of technical and human aspect of change management is essential as well as the combination of Lean six sigma tools.

D. CHANGE MANAGEMENT AND LSS READINESS

Lagrosen, Chebl, and Max (2011) argue that as lean six sigma implementation requires institutional learning, the institution can make readiness assessments by using learning theories. They mainly combined the learning theories with the human side of the change imposed by the process improvement. Hence they offered a readiness assessment

model (Figure10) for the deployment of Lean six sigma that includes change environment and also change management.

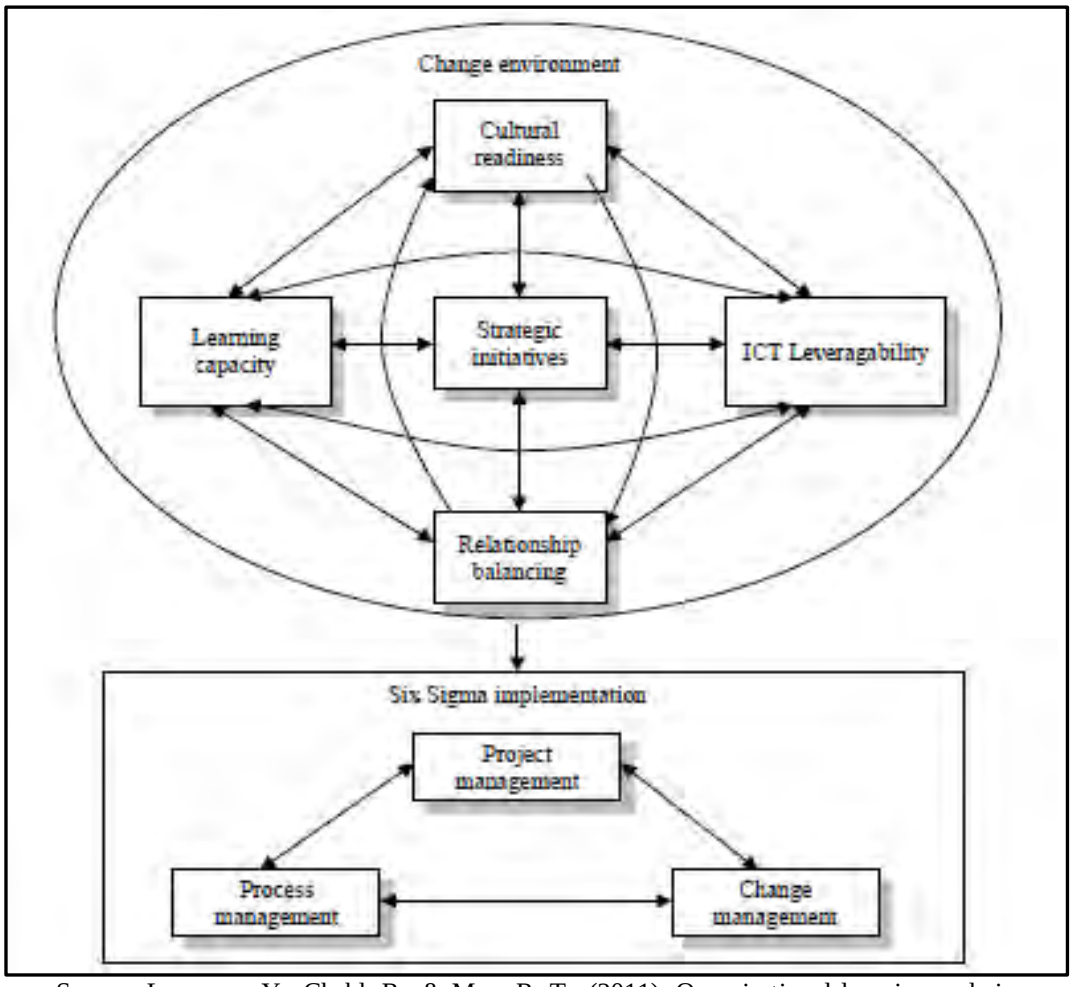
Strategic initiatives indicates the senior and top management support for the success of process change by continuous improvement methods. Cultural readiness is another essential factor because organizational culture determines the individual or organizational learning capacity as well as the flow of the information in a changing environment (Kilman et al., 1986).

Change management indicates the organization's ability to overcome the resistance to change problem. (Kettinger and Grover, 1995). Lagrosen et al. (2011) note that "the structural elements of the Six Sigma framework all stimulate change." Magnusson et al. (2003), as cited in Lagrosen et al. (2011, p. 31), suggest the following concerns for the successful implementation of lean six sigma by getting the support of members of the organization:

> to take care of people in order to align their mental models favorably through coaching, workshops and group-building initiatives; to formulate goals, to create a sense of purpose for individuals; to instill feelings that they own the change; being aware that change takes time and finally to have the support and commitment of senior management for improvement in general.

Figure 10 summarizes their readiness for six sigma implementation model.

Figure 10. The Readiness Assessment Model



Source: Lagrosen, Y., Chebl, R., & Max, R. T., (2011), Organisational learning and six sigma deployment readiness evaluation: A case study, *International Journal of Lean Six Sigma*, 2(1), 23–40. doi:http://dx.doi.org/10.1108/20401461111119431

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VI. RESEARCH METHODOLOGY

A. INTRODUCTION

This chapter discusses the research methods we used in this project. First we will describe the goals of the survey and how we aimed to answer the research questions. Next, we will describe the survey design, the specific instrument type used for this survey, and the survey participants. We conclude with the method of analysis and the limitations of the survey.

B. SURVEY GOALS

The main goal of our survey was to answer the following research questions:

- Are there any significant cultural differences between Turkish and U.S. military organizations in terms of readiness to change and continuous improvement?
- How amenable is Turkish military culture to change and continuous improvement?
- What might be the major obstacles to implement Lean Six Sigma (LSS) in the Turkish army?
- What steps can be taken for a successful LSS deployment plan in the Turkish army?

Before deploying LSS into an organization, the current culture within the organization must be assessed. Some cultures will accept it more easily than others. These assessments will enable the leaders to decide whether the organization is responsive to LSS or in need of adaptation in order to align with LSS thinking. Thus, organizations need to assess their preparedness before implementing LSS. Since this method is a change initiative for the organization's culture, we focused on the change readiness and continuous improvement readiness to determine the practicality of implementing LSS in the Turkish army.

Our goal was to understand how amenable Turkish military culture would be to LSS in terms of change with continuous improvement and to draw a cultural comparison from the mid-level manager perspective. To do this, we conducted an online survey titled

"Measuring organizational readiness to change and continuous improvement for Lean Six Sigma implementation" with Turkish and U.S. students at the Naval Postgraduate School (NPS).

C. SURVEY DESIGN

We conducted an anonymous online survey to achieve the research objectives. The NPS Institutional Review Board reviewed and approved the survey. We administered the survey electronically, via Lime Survey, an open-source surveying tool that is hosted by NPS during the time period of August 27, 2015 to October 12, 2015. The details about the survey design and questions are provided below. We address the results and analysis of the survey in the next chapter.

The survey consisted of two groups of questionnaires. The first questionnaire asked the survey participants about their perception of their organization's readiness for change as it pertains to their previous experiences. Instead of developing new scales for our survey, we used validated surveys in published studies. So in order to measure the organizational readiness for change of two different cultures, we used the perceived organizational readiness for change (PORC) scale developed by Cinite, Duxbury and Higgins (2009). There are two main reasons why we have chosen this scale. First, this scale was developed specifically for the public sector which includes military organizations. Second, it includes not only readiness subscales but also unreadiness subscales.

The first questionnaire included a total of 17 five-point Likert scale questions in five subcategories. The first three categories of the scale measured the readiness for change whereas section 4 and 5 aimed to measure the unreadiness for change. Questions 1 through 4 addressed the factor of commitment of senior management to the change. Questions 5 through 8 pertained to the factor of competence of change agents. Questions 9 through 11 related to the support of immediate manager factor. Questions 12 through 14 asked about poor communication of change factor. And finally questions 15 through 17 investigated "the adverse impact of the change on work" (Cinite et al., 2009). The PORC scale is located in the Appendix section of this report.

In addition to measuring readiness to change with the first questionnaire, we also inquired into the readiness level for a continuous improvement method in another questionnaire. For this purpose, we used continuous quality improvement (CQI) readiness assessment scale developed by Dana (2004). CQI scale aimed to measure the opinions of the participants on the areas that are essential for the successful implementation of the continuous process or quality improvement by some changes in the culture of the organization. The survey also sought to identify possible obstacles in practicing Lean Six Sigma method in Turkish military culture and steps for a successful LSS deployment plan in the Turkish army.

CQI readiness survey included a total of 25 five-point Likert scale questions describing five different dimensions. Questions 1 through 10 asked the dimension of internal focus and team process indicating the engagement of the employees in the overall mission of the organization. Questions 11 through 14 related to the dimension that measures the process understanding of the employee while doing his/her job requirements. Questions 15 through 18 addressed the dimension that describes the use of data in decision-making, which is one of the key tools in Lean Six Sigma projects. Questions 19 through 21 related to the fourth dimension and asked for the "common understanding of quality and customers' needs and expectations" (Dana, 2004). Finally, questions 22 through 25 aimed to measure the capability of the management to direct CQI. The scale is also located in the Appendix section of the report.

Both questionnaires were taken at the same time. At the end of the survey, in order to differentiate between Turkish and American participants, they were asked to provide their country of origin, military service and years of professional military experience.

D. SURVEY PARTICIPANTS

U.S. and Turkish military officers studying at NPS participated in this survey. We invited the participants via recruitment email and also personal contact (face-to-face, phone, text). They received the consent form as the first question of the survey and only

those who provide consent were allowed to continue and complete the survey. Then they answered a series of questions online via Lime Survey.

There are 47 Turkish students at NPS. We aimed to get 40 complete responses from Turkish participants. And for a sufficient statistical comparison, we needed at least the same number of U.S. officers. This sample size provided a sufficient variety of mid-manager perspectives and provided us with a wide pool of experiences. The size of the survey was relatively large and diverse enough to supply relevant information for the research.

In order to minimize the risk to the subjects, we did not ask the participants for their names or any personal identification. Only the rank, service information, and years of experience were requested from the participants. They could choose to withdraw from the study at any time.

E. METHOD OF ANALYSIS

For the analysis of the first questionnaire, we used basic statistical tools like mean and standard deviation to get the average distribution of five point Likert scale results. Then we used Pearson's chi-square test of independence to determine the statistical difference the between Turkish and U.S. participant groups.

"Pearson's chi-squared test is a statistical test applied to sets of categorical data to evaluate how likely it is that any observed difference between the sets arose by chance. It is suitable for unpaired data from large samples" ("Pearson's chi-squared test," n.d.). There are several types of chi-square test but Pearson's is the most common. The characteristic of this test was first established by Karl Pearson (1900). Pearson's chi-squared test is very useful in identifying the statistical difference between the actual test results and the distribution of the statistics.

We used Dana's (2009) CQI Climate Survey Report Generator to analyze the responses of the second questionnaire. In this generator, the author calculated the averages of the each questions and then made an assessment according to the total agreement rate of the respondents.

F. SURVEY LIMITATIONS

Firstly, due to the self-reporting nature of the survey, it is limited in that the responses of the participants reflect only their personal opinions and not the official viewpoints of each military organization. The results of the survey were generalized to make organization level assessments.

Secondly, the participants of the survey were limited to the U.S. and Turkish military officers studying at the Naval Postgraduate School. The participants were all nearly the same age and had roughly the same amount of military experience. They generally represented only the mid-manager opinions of their military organizations. Hence, the research lacks the perspective of senior managers.

Thirdly, the respondents of the survey were an isolated group away from their typical daily working environments. They could be influenced by academic conditions rather than their original military organizations.

Fourthly, there was a possible bias in the CQI survey, question 9, because the subjects were students at NPS and primed for learning.

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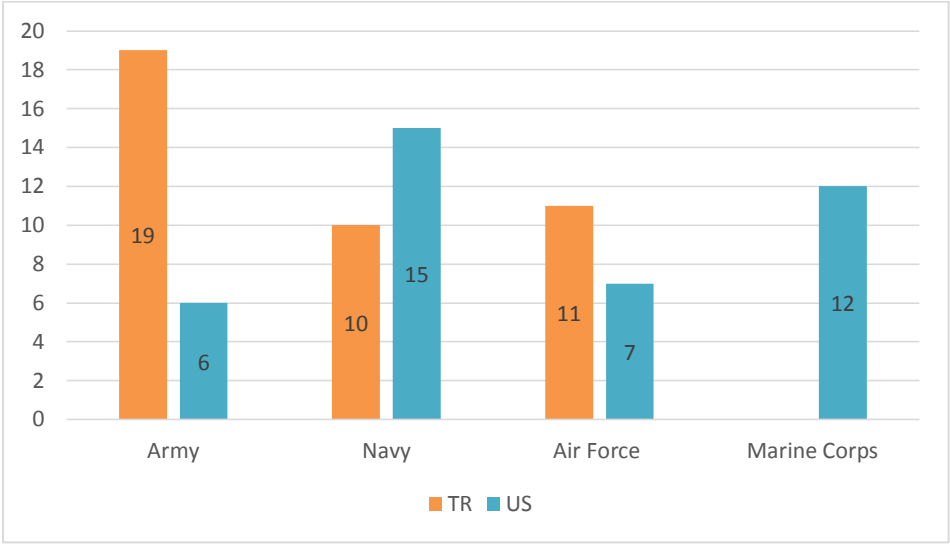
VII. RESULTS AND ANALYSIS

A. INTRODUCTION

This chapter summarizes the outcomes obtained from the "Measuring Organizational Readiness to Change and Continuous Improvement for Lean Six Sigma Implementation" survey answered by U.S. and Turkish officers at the Naval Postgraduate School. Appendix provides an overall review of survey responses.

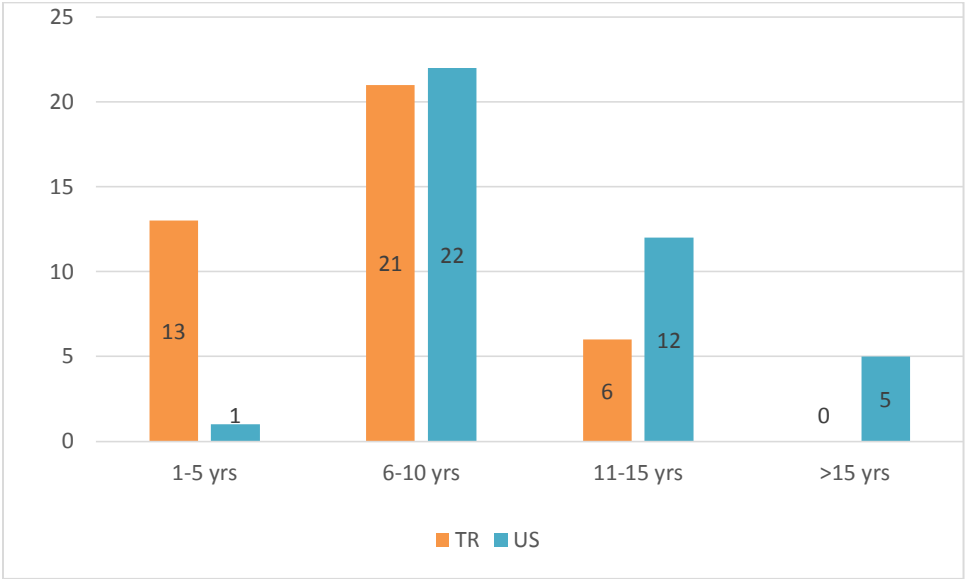
Our goal was to get a comparable number of answers from students of each country. We invited 47 Turkish students to take the survey and all of them answered but 7 of surveys were incomplete. So we tried to get at least 40 answers from U.S. students. We sent invitations to 85 U.S. students from different services and we finished the survey when we had 40 completed surveys. In summary, 132 U.S. and Turkish Naval Postgraduate School students from various military services got the survey. We excluded 47 incomplete surveys (7 incomplete Turkish responses and the 45 potential student after we closed the survey) from the analysis. The demographics of the 40 Turkish and 40 U.S. officer respondents is as follows (see Figure 11): 19 Turkish army, 10 Turkish Navy and 11 Turkish Air Force; 6 U.S. Army, 15 U.S. Navy, 5 U.S. Air Force and 12 U.S. Marine Corps.

Figure 11. Distribution of the Participants According to Their Service Branches



All of the participants are considered mid-managers of their organizations. Participants' number of years of service is shown in Figure 12.

Figure 12. Distribution of the Participants According to Their Years of Experience



B. RESULTS

The "Measuring Organizational Readiness to Change and Continuous Improvement for Lean Six Sigma Implementation" survey consists of two separate surveys: "Measurement of Perceived Organizational Readiness for Change" (Cinite et al., 2009) and "Continuous Quality Improvement Climate Survey" (Dana, 2004). Using these surveys participants' military organizations may be analyzed separately. But since our goal is to determine cultural differences between Turkish and U.S. military organizations, we will focus on comparing results in general.

1. Measurement of Perceived Organizational Readiness for Change

This survey consists of five subtitles; the first three provide information about readiness for change, and the last two subtitles evaluate unreadiness of the organization for change. Cinite, Duxbury, and Higgins allocate the questions according to the following subheadings:

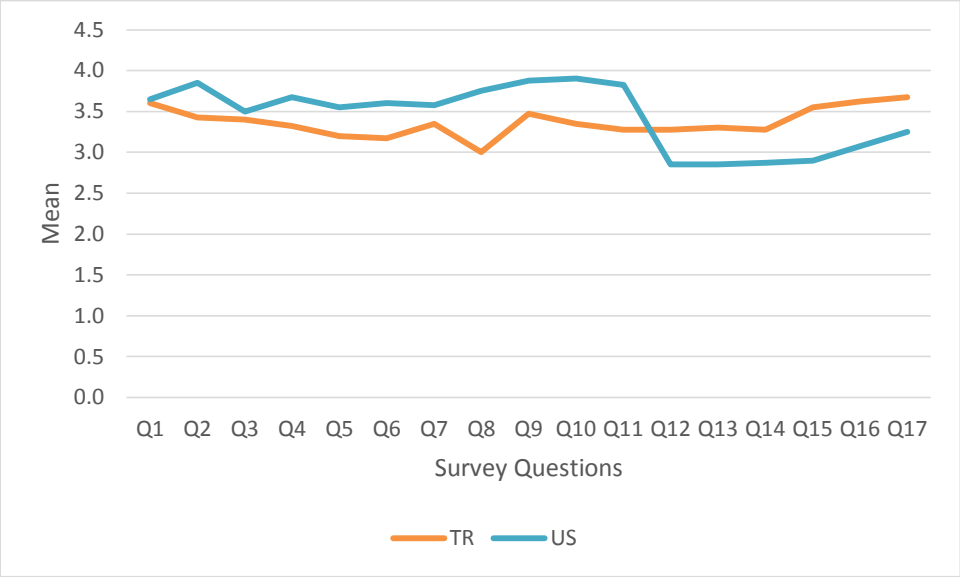
- Readiness for change:
  - Part 1 Commitment of senior management to the change Q1-Q4
  - Part 2 Competence of change agents Q5-Q8
  - Part 3 Support of immediate manager Q9-Q11
- Unreadiness for change:
  - Part 4 Poor communication of the change Q12-Q14
  - Part 5 Adverse impact of the change on the work Q15-Q17 (Cinite at al., 2009)

Table 2 of the appendix shows PORC survey results for Turkish students, and Table 3 shows PORC survey results for U.S. students.

The results of the survey indicate that the U.S. military's readiness for change is slightly higher than the Turkish military's readiness for change. The means of the U.S. officers' answers for the readiness for change questions are higher than the means of the Turkish officers' answers for the same questions. Similarly, the means of U.S. participants' answers for the unreadiness for change questions are slightly lower than the

means of Turkish participants' answers for the same questions. Although results show differences between U.S. and Turkish military organizations, there are two important points. First, as Figure 13 shows, the difference between the means is not largely significant—the average of the differences of the means is 0.4.

Figure 13. Comparison of Measurement of Perceived Organizational Readiness for Change Survey Results



Secondly, for each question of the survey we conducted Pearson's chi-square test of independence to determine if there is a statistically significant difference between the responses of two groups. Null hypothesis and alternative hypothesis are as follows:

- Ho: Survey results are independent of nationality.
- Ha: Survey results are not independent, that is Turkish and U.S. students' responses are different.

As a result of chi-square test, five of seventeen questions chi-square *p*-value was smaller than 0.05 so we rejected null hypothesis and we decided that answers of five questions show statistically significant difference between U.S. and Turkish participants.

The following are the Cinite, Duxbury and Higgins's survey questions that we interpret to be different for the two groups:

- Q6. Change agents provide valid arguments to justify the change (p-value: 0.0100)
- Q8. Change agents are competent to answer employee questions about the change. (p-value: 0.0069)
- Q9. Managers are held accountable for passing information on the change to their staff. (p-value: 0.0057)
- Q13. The reasons for the change are not well explained (p-value: 0.0264)
- Q16. Workloads do not permit people to get involved in the change initiatives. (p-value: 0.0200) (Cinite et al., 2009)

For other questions chi-square *p*-values were greater than 0.05 so we accepted null hypothesis. Results of responses to the other questions were independent of nationality.

2. Continuous Quality Improvement Climate Survey

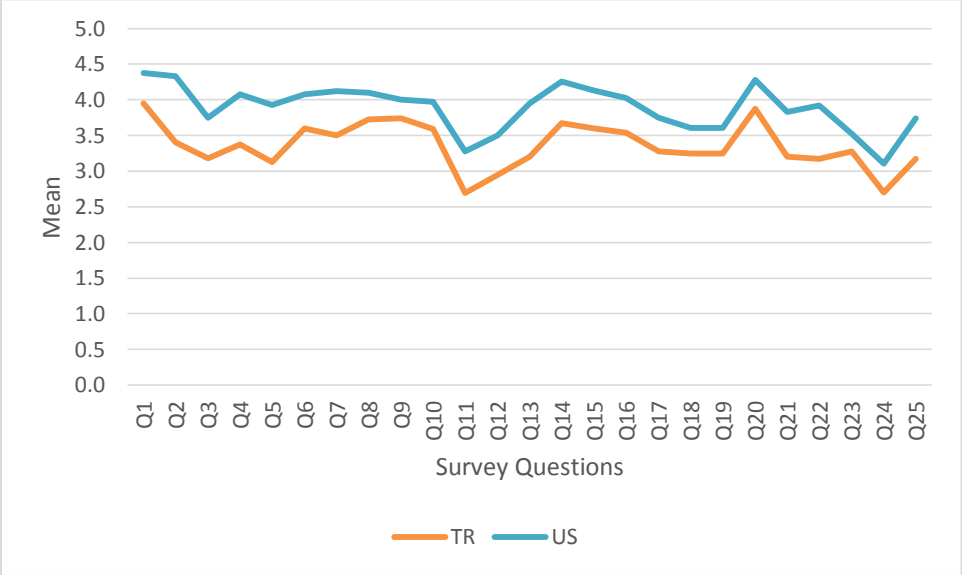
Dana divides the questions into five parts for further analysisas follows:

- Internal customer (employee) focus and use of team process (Q1-Q10)
- Understanding of process (Q11-Q14)
- Use of data in decision-making (Q15-Q18)
- Common understanding of quality and customers' needs and wants (Q19-Q21)
- Management's opportunity to lead CQI (Q22-Q25) (Dana, 2004)

We used Dana's (2004) CQI Climate Survey Report Generator to organize the responses. Appendix Table 4 shows CQI Climate Survey Report for Turkish students and Table 5 shows CQI Climate Survey Report for U.S. students. "Total agree" column in the table shows sum of "strongly agree" and "agree" columns and defines the support of respondents for that statement.

The results of CQI Climate Survey show that all means of U.S. participants' responses are higher than the means of Turkish participants' responses. The average of the differences of the means is 0.5 (see Figure 14).

Figure 14. Comparison of CQI Climate Survey Results



As we did in the first survey, for each question of the CQI Climate Survey we conducted Pearson's chi-square test of independence to determine if there is a statistically significant difference between the responses of the two groups. We had the same null and the alternative hypothesis.

Results of the chi-square test of independence for the CQI Climate Survey was different than the first survey. *P*-values for almost 50% of the questions (twelve of twenty-five) were smaller than 0.05 so we rejected null hypothesis for the Dana's following survey questions and we concluded that responses to the questions show statistically significant difference between U.S. and Turkish participants:

- Q1. I know what is expected of me at work. (*p*-value: 0.0108)
- Q2. I have the materials and equipment I need to do my work well. (*p*-value: 0.0012)
- Q4. Someone at work encourages me to develop my skills. (*p*-value: 0.0381)

- Q5. I receive the information I need to do my job well. (*p*-value: 0.0070)
- Q6. Our employees cooperate and work as a team. (*p*-value: 0.0274)
- Q7. We are encouraged to work with staff in other departments to solve problems. (*p*-value: 0.0468)
- Q12. The work assignments are well planned in my department. (p-value: 0.0070)
- Q13. We are encouraged to apply better methods for doing our work when we learn about them. (*p*-value: 0.0188)
- Q14. Overall, I am motivated to find ways to improve the way I do work. (*p*-value: 0.0128)
- Q21. Overall, meeting the expectations of our residents and families is a top priority here. (*p*-value: 0.0115)
- Q22. Our leaders are just as concerned about the quality of services as they are about financial results. (*p*-value: 0.0304)
- Q25. Overall, the facility managers have the ability to lead us to higher levels of quality performance. (*p*-value: 0.0384) (Dana, 2004)

For other questions, chi-square *p*-values were greater than 0.05, so we accepted null hypothesis. Results of responses to the remaining questions were independent of the nationality.

C. ANALYSIS

This part addresses the analysis of the survey results using findings of Cinite et al. (2009) for organizational readiness for change survey and findings of Dana for CQI climate survey. On top of these findings we will make comments comparing U.S. and Turkish Officers' answers.

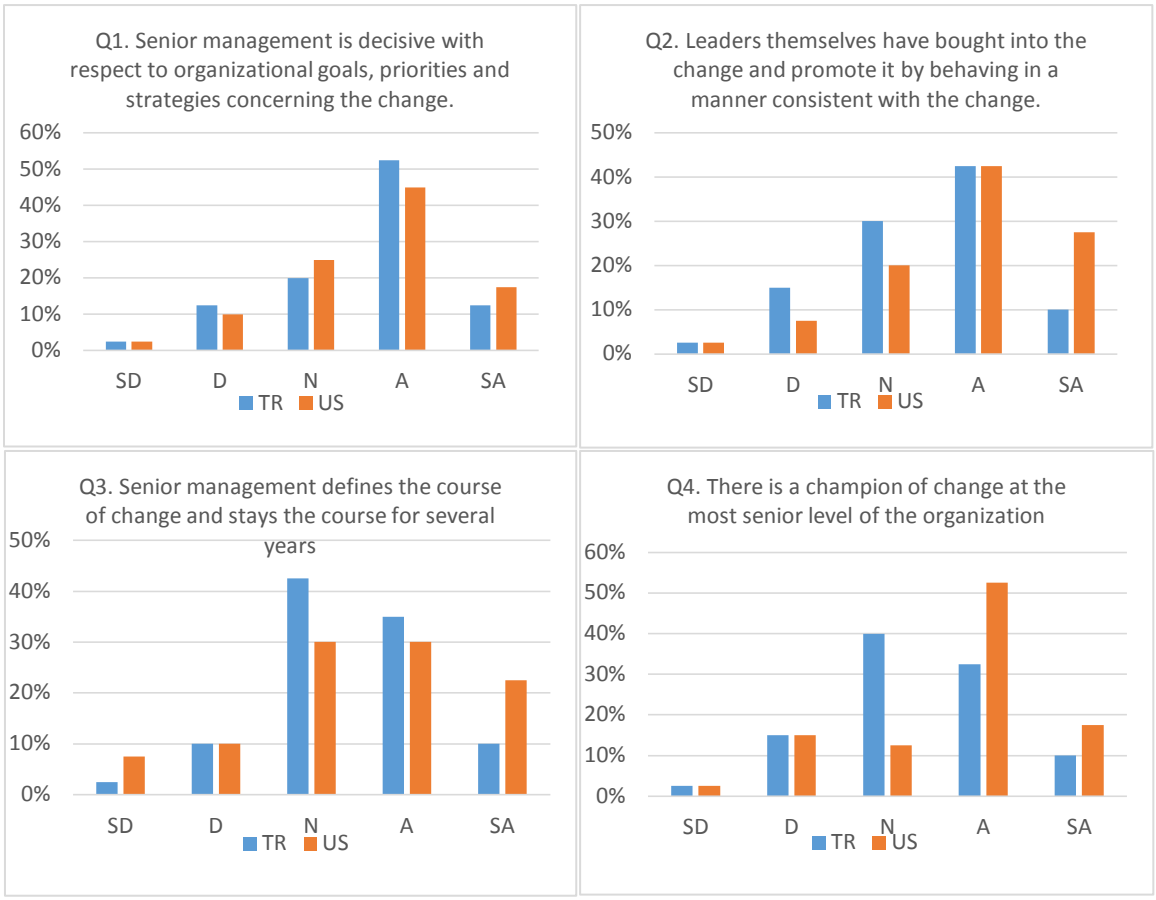
1. Measurement of Perceived Organizational Readiness for Change

As we explained in the results section, Cinite et al. (2009) divided their survey into five factors. We will make our analysis according to following five factors.

a. Commitment of Senior Management to the Change

Cinite et al. (2009) say this factor explains perception of the officers "how senior management acted during transformational change." Higher results mean "there was a champion of change at the most senior level, a senior management team who was decisive with respect to organizational goals, priorities and strategies concerning change, who defined the course of change and did not digress from it and who supported the change, and leaders who demonstrated their commitment to change through their behaviors" (Cinite et al., 2009). Figure 15 shows these results.

Figure 15. Comparison of PORC Survey Responses for Q1 to Q4



As indicated in Figure 16, for this factor there is almost no difference between the answers of the U.S. and Turkish students. Moreover as a result of Pearson's chi-square test of independence, none of four questions shows statistically significant difference between two groups. So we inferred that senior management of the two military organizations consistently support the change initiatives.

Figure 16. Comparison of PORC Survey Responses for Factor 1

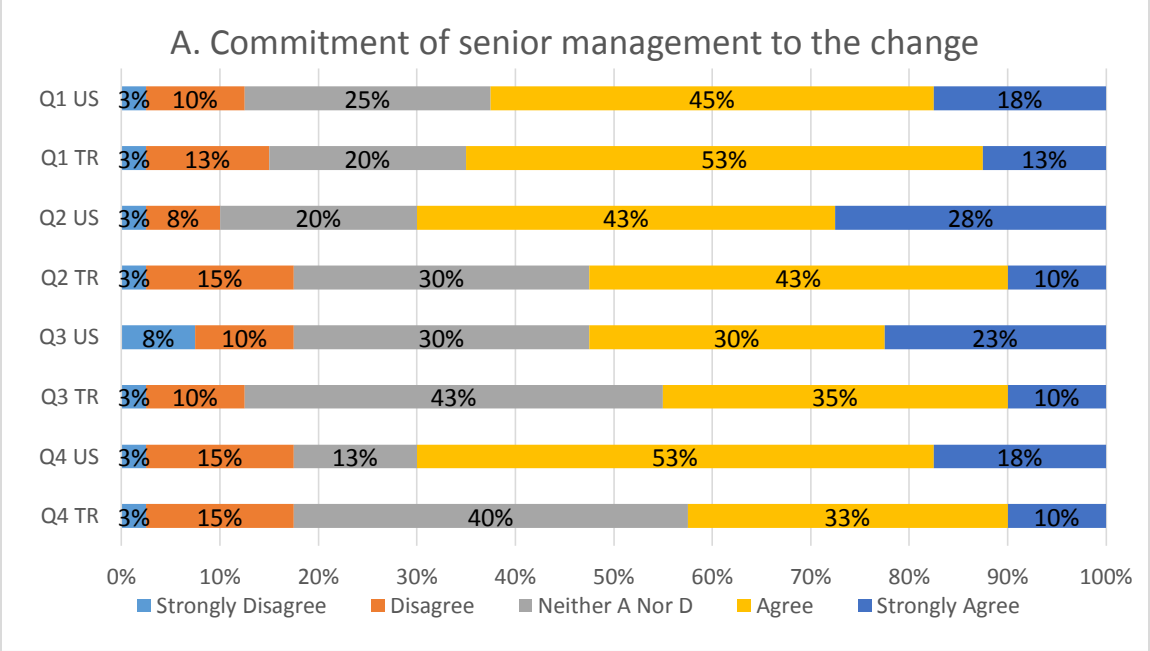


Figure 16 makes it easier to compare all four questions of factor 1. We can easily see in Figure 16 that responses of two groups are very similar, with the U.S. respondents generally having slightly greater agreement with the statements..

b. Competence of Change Agents

Cinite et al. (2009) point out that "this factor was related to the actions and behaviors of those who had been charged with implementing the change-change agents." Higher results imply organization is ready for change "when change agents had done research to select the right types of change, considered different options with respect to

implementing the change, had provided valid arguments to justify the change, and could answer employee questions about the change" (Cinite et al., 2009).

This factor shows the most prominent difference between two groups; two of four questions are significantly different. Figure 17 shows the results. Firstly, every change initiative needs responsible change agents. Lack of these agents may cause failure of understanding the cause of the problem by other employees. Secondly, the roles of the change agents are specifically crucial for a successful implementation of a LSS project. Because LSS requires an assigned project group members of green, yellow or black belts to conduct the LSS project and track improvements. Hence, while practicing LSS, this factor could be a critical obstacle for the Turkish army. In order to cope with this problem, Turkish change agents should be more willing to answer the questions about the change model and convince others assuring all aspects of the change including solid results driven by the improvements.

Figure 17. Comparison of PORC Survey Responses for Q5 to Q8

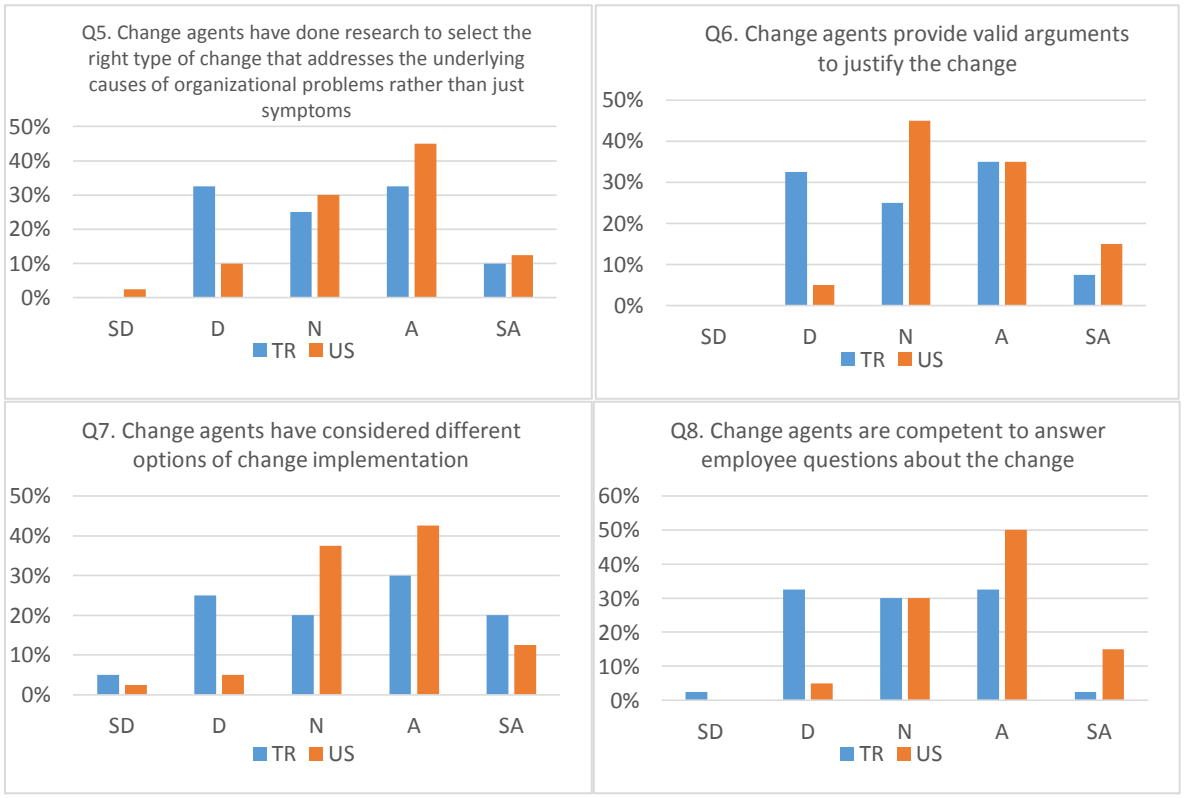


Figure 18. Comparison of PORC Survey Responses for Factor 2

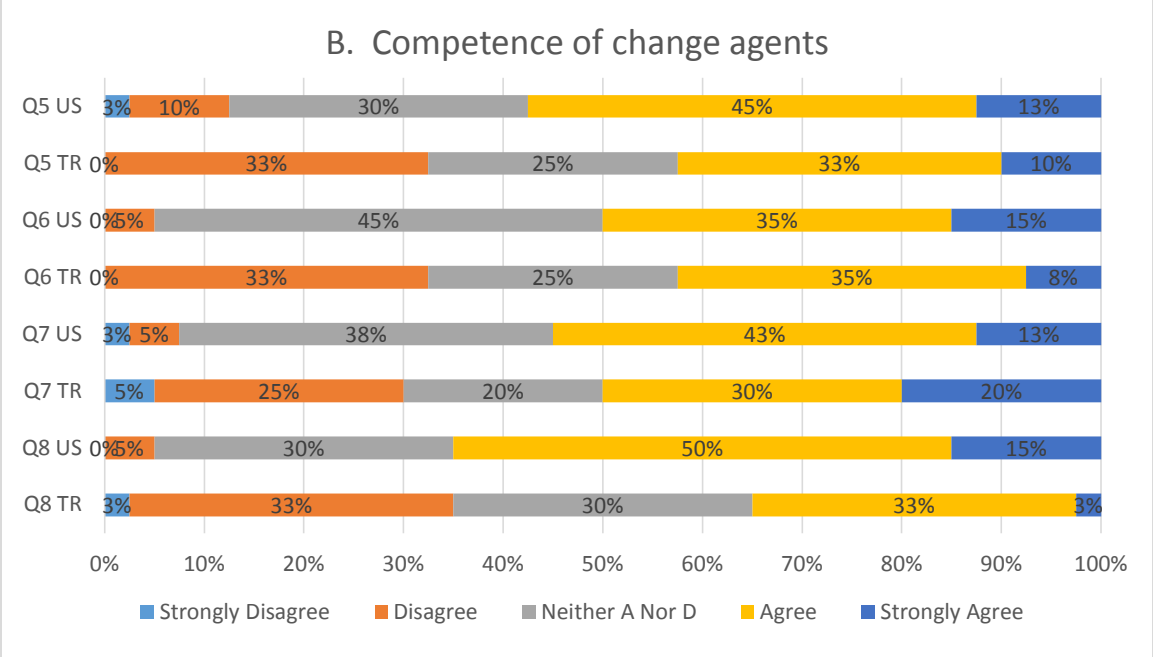
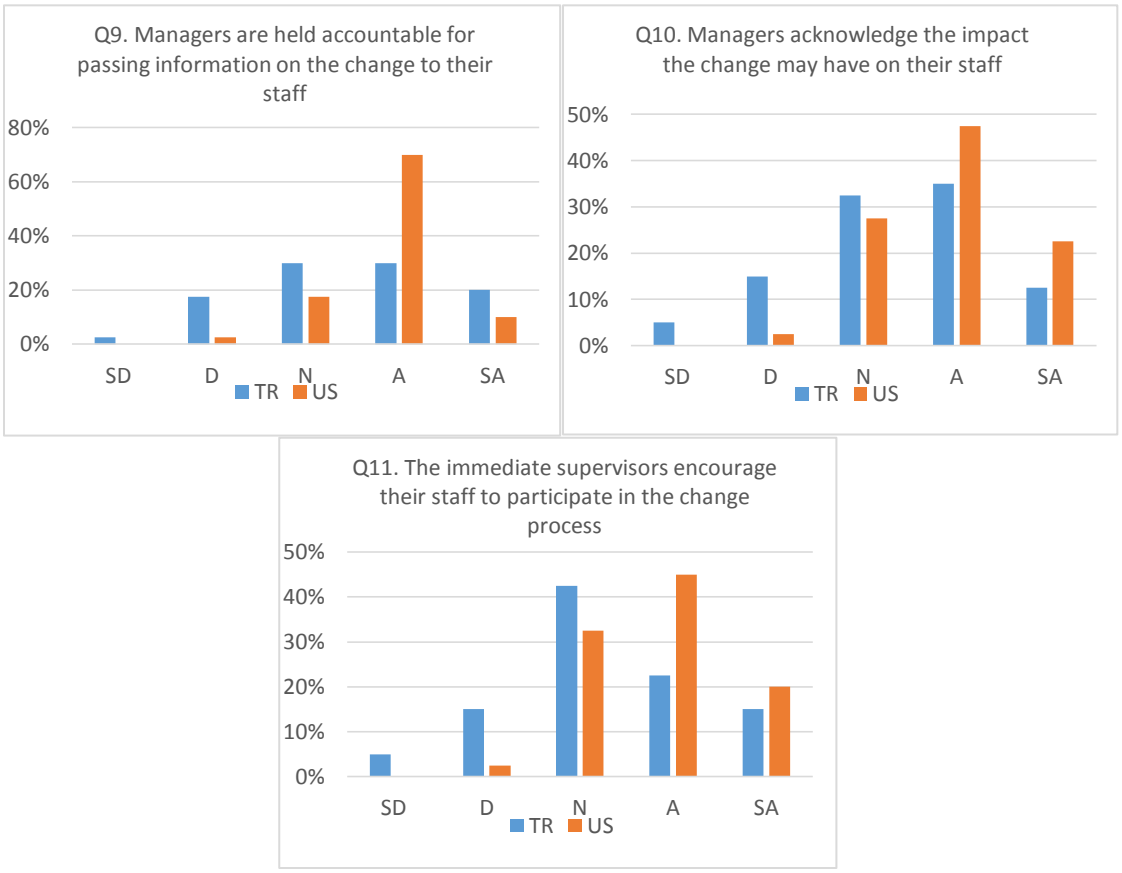


Figure 18 makes it easier to compare all four questions of factor 2. Differences for Question 6 and Question 8 are clear in Figure 18.

c. Support of Immediate Manager

Cinite et al. (2009) state that this factor indicates whether supervisors support their subordinates throughout the change process or not. They say this factor assesses whether "employees perceived their organization to be ready for change when their immediate manager encouraged their staff to participate in the change initiatives, acknowledged the impact of the change on people, and shared information provided from upper management on the change" (Cinite et al., 2009). Figure 19 shows these results.

Figure 19. Comparison of PORC Survey Responses for Q9 to Q11



Participants of our survey are middle supervisors of their organizations so they will be the immediate managers for any change effort among the organization. Their role to deliver the information about the change to their team is crucial. We infer from the results of this factor questions that Turkish middle supervisors should be held more responsible in their role as immediate managers. We may also say that middle managers in Turkish military organizations are less effective in supporting the change.

Figure 20. Comparison of PORC Survey Responses for Factor 3

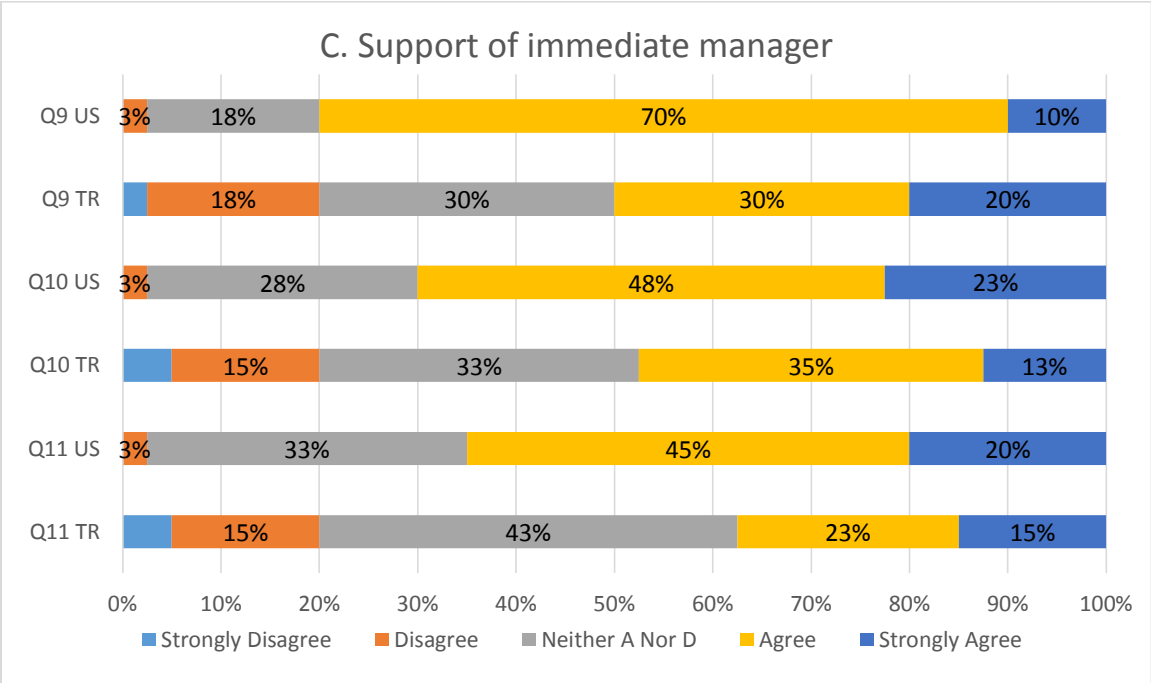


Figure 20 makes it easier to compare all three questions of factor 3 and the difference in Question 9 is clearly noticeable.

d. Poor Communication of Change

Starting from this factor, last two factors indicate incorrect practices for the change so results of these questions show how unready organizations are for a change process. According to Cinite et al. (2009) first part examines the effects of poor communication on change. “Public servants believed the organization was not ready to implement change successfully when employees were not provided a vision for the change, the reasons behind the change or the expected outcomes and benefits of the change” (Cinite et al., 2009). Figure 21 summarizes the results.

Figure 21. Comparison of PORC Survey Responses for Q12 to Q14

For the three questions of this factor, average of Turkish participants answers are 0.4 point higher than U.S. participants. Therefore, we may infer that due to communication of change Turkish military organizations seem less ready to implement change. But there is siginificant difference between two groups only for explaining the reasons of the change. So Turkish military organizations should pay attention explaining reasons of a change effort throughout the organization.

Figure 22. Comparison of PORC Survey Responses for Factor 4

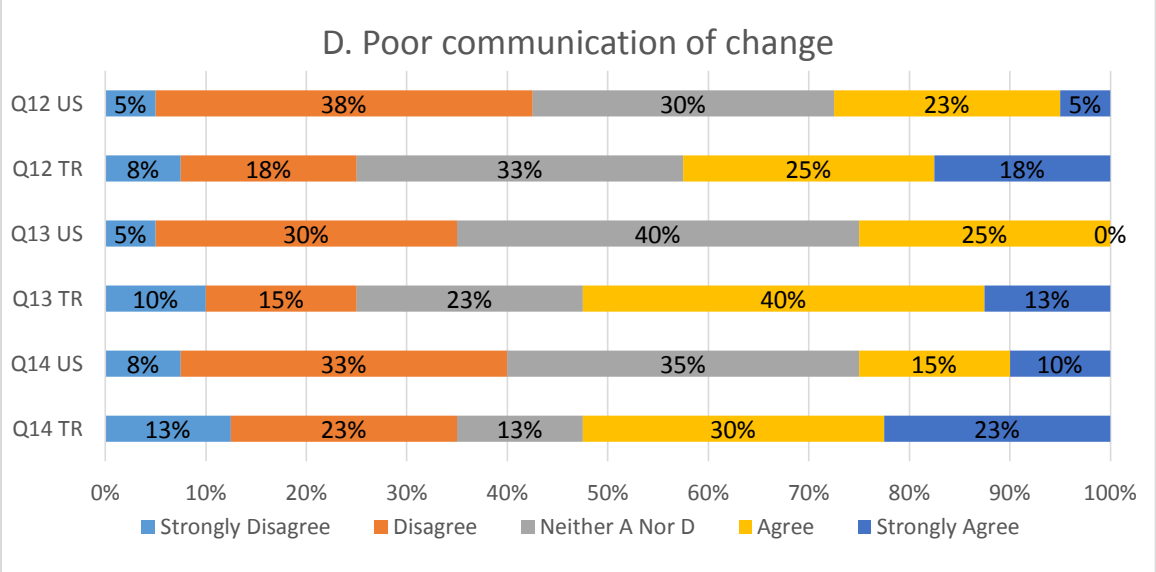


Figure 22 makes it easier to compare all three questions of factor 4 and the difference for Question 13 is clear.

e. Adverse Impact of the Change on Work

Cinite et al. (2009) state this factor involved five questions related to perception of change's negative effect on work environment. "Public servants saw their organization as not being ready for change when new duties were added on top of the old ones, people were discouraged from saying 'no' to work, and their workloads increased" (Cinite et al., 2009). Figure 23 summarizes the results.

Figure 23. Comparison of PORC Survey Responses for Q15 to Q17

Similar to the previous factor, Turkish participants' average of answers are higher than U.S. participants meaning that any change process may result negative effects on work for Turkish military organization members. The main reason for this adverse impact looks like caused by extra workload created from change process. If organization members are already too busy with their current assignments, they may not want to support and be involved in any change initiative. Therefore, change process should remove some of old tasks and create space for members to work and think about change.

Figure 24. Comparison of PORC Survey Responses for Factor 5

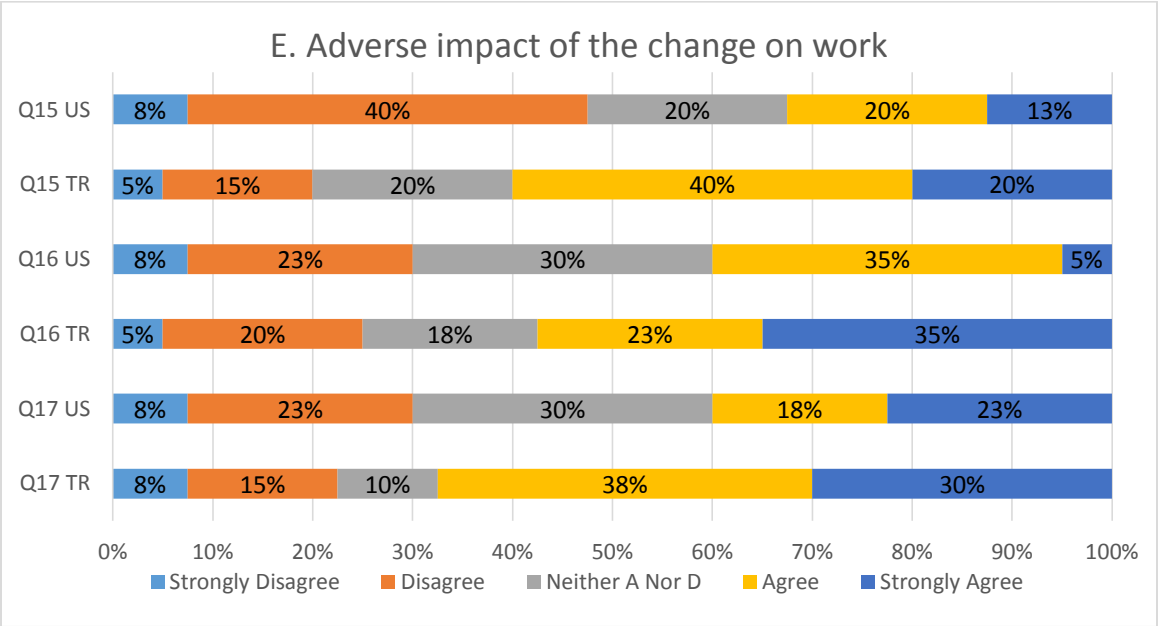


Figure 24 makes it easier to compare all three questions of factor 5 and we can see the difference for Q15 obviously.

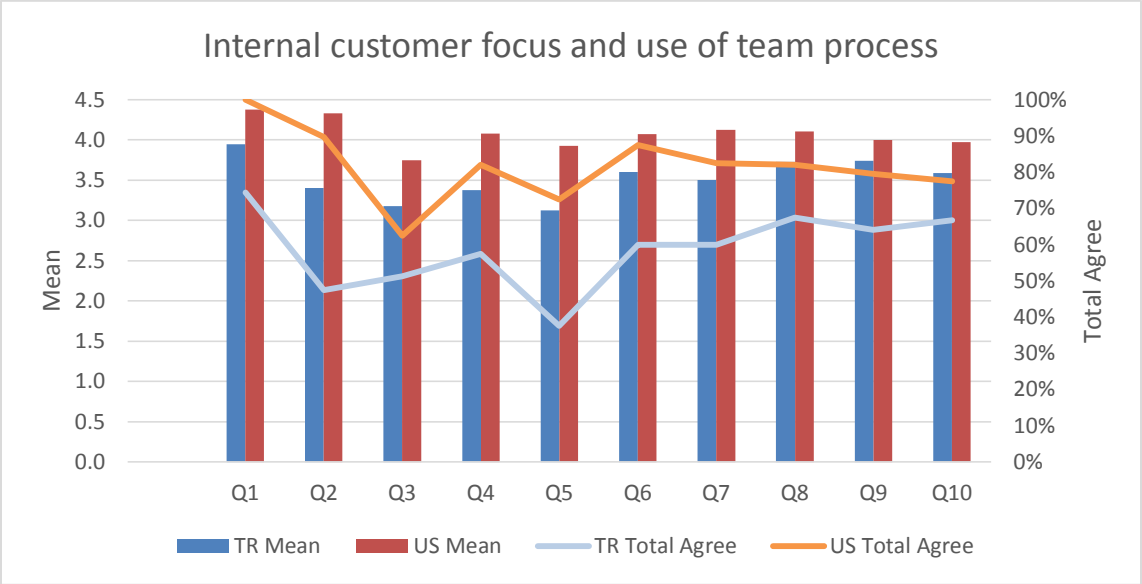
2. Continuous Quality Improvement Climate Survey

We will divide Dana's CQI Climate Survey into five parts and separately analyze what each factor means and compare our results from NPS U.S. and Turkish students' responses.

a. Internal Customer Focus and Use of Team Process

According to Dana, low "total agree" results for the questions in this factor (Q1-Q10) show that personnel is not convinced with the goal of the organization and may not assist change efforts. There may also problems with the participation of employees to team projects. Responses to Questions 1–5 indicate personnel's individual involvement in his or her job. Questions 6–10 are more likely about team work in the organization and especially question 10 is the summary of this factor (Dana, 2004).

Figure 25. Comparison of CQI Survey Results for Factor 1



This factor shows the most dominant distinction between the Turkish and U.S. respondants. Difference between the average of means is highest with the average of 0.7 for the first ten questions. And according to the Pearson's chi-square test six of ten questions' responses show statistically significant difference among the two groups. Moreover "total agree" columns for the first ten questions in Table 4 and Table 5 are another indicator for the gap between Turkish and U.S. officers. We can make many comments on these results but we think this factor has a small effect on LSS aplication in an organization since questions in this factor focus on individual employees' perceptions. So we will focus on some remarkable findings that may affect the change process in a Turkish military organization.

Dana's (2004) question 5 has the smallest "total agree" percentage of 38% for Turkish respondants in this factor: " I receive the information I need to do my job well."The same percentage for U.S. participants is 73%. Poor communication between leaders and employees may cause severe damage to the organization. Leaders may have the perfect plans for change but they will probably fail if the personnel do not show the performance they are asked for. Immediate managers play a critical role as a bridge between senior management and the staff. As a result, Turkish military organizations may

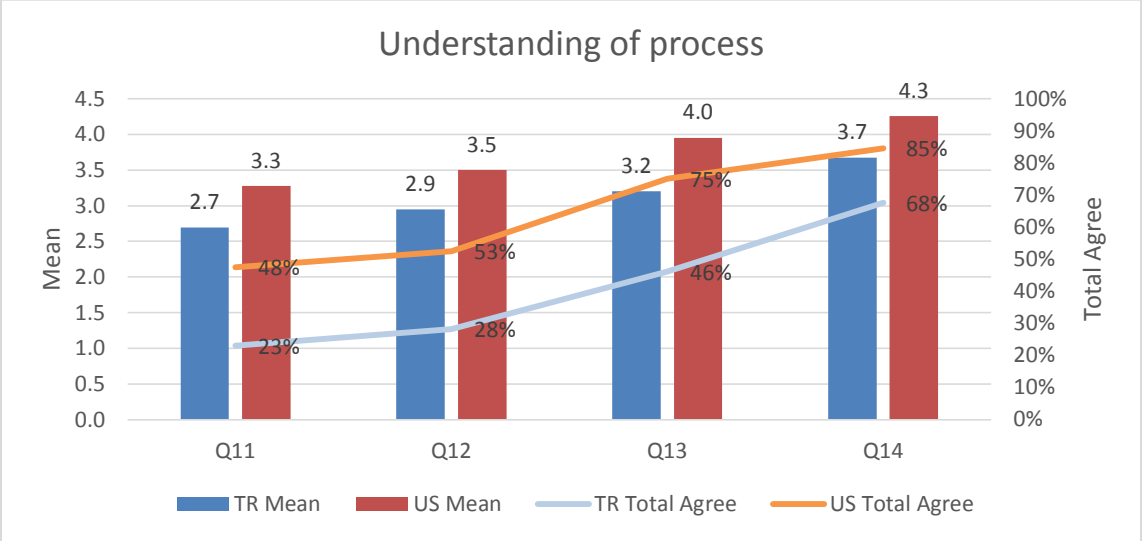
need to increase communication channels among the organization and encourage personnel to participate more in team assignments.

There is 11% difference between the "total agree" column of Dana's question 10 about leaders' care on staff; 78% in U.S. responses and 67% in Turkish responses. There is not a significant difference and we assess these percentages are low for both sides. As expected from a military organization, leaders always need to care about their subordinates. This would also help them to understand what they need to focus on implementing a change process. Leaders in military organizations need to remove obstacles both between them and their staff and among their personnel so that everyone can easily communicate about their job including change processes.

b. Understanding of Process

Dana (2004) says low "total agree" in this factor points out that senior management and personnel do not understand how control of work processes affect quality of the job they do. Responses of questions in this factor indicate how the organization behaves when something goes wrong and personnel's perception of quality of planning in the organization. And lastly we can see if staff try to improve the work processes by themselves.

Figure 26. Comparison of CQI Survey Results for Factor 2



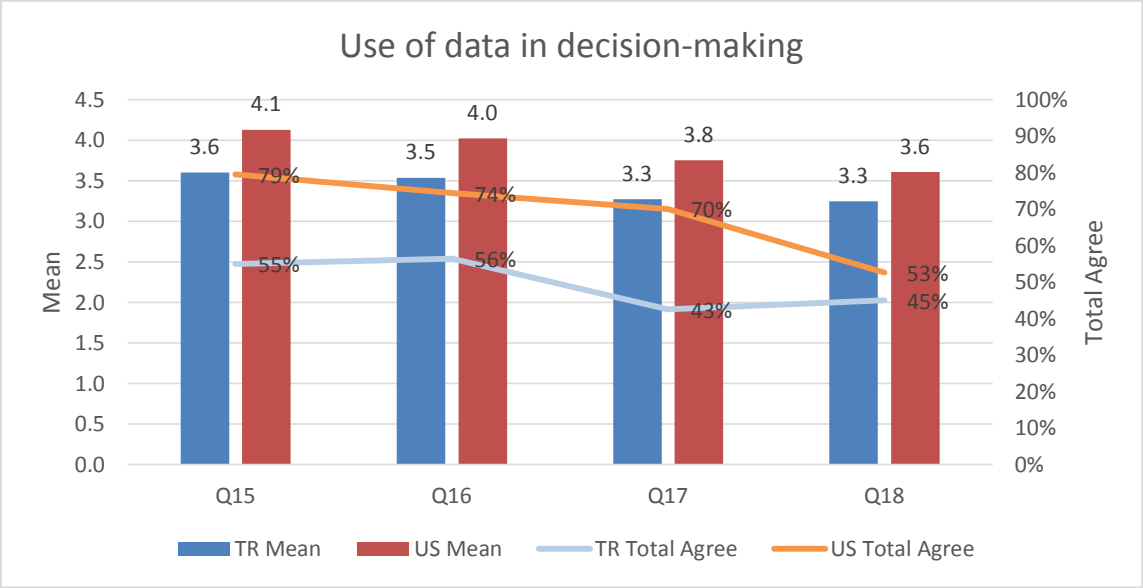
In this factor also difference between two groups is explicitly certain. Difference between the average of means is 0.6 for questions 11–14. And according to the Pearson's chi-square test three of four questions' responses show statistically significant difference between the two groups. Dana's (2004) Question 11 in this factor "When something goes wrong, we look at the way we do our work rather than blaming people" has the smallest "total agree" percentage of the whole survey with 23% for Turkish respondants. U.S. officers' "total agree" percentage is 48% for the same question. We can accept results normal for a military organizations since every military personnel is held accountable for his or her action. But this should not prevent leaders to look for possible problems in the work processes. Another problem we can infer from results is potential problems about planning. A twenty-eight percent "total agree" percentage in question 12 about assignment planning for Turkish respondents tells us we need to work on this issue.

Lean Six Sigma may be a perfect solution to organizational problems related to this factor about work processes since with LSS, change agents will focus on improving processes whether personnel causes the problems or not. Ultimate goal must be having a better work process without blaming anyone in the organization. Once a process is analyzed and reallocated with LSS, the new process will also help planning the workload according to workforce.

c. Use of Data in Decision Making

In this factor for question 15–18, Dana (2004) points out a low "total agree" means personnel in an organization does not evaluate quality of their work properly and organization does not use the information system effectively to improve their quality and for decision-making. An organization may find the reasons of many of its problems with the data among the organization; see Figure 27.

Figure 27. Comparison of CQI Survey Results for Factor 3

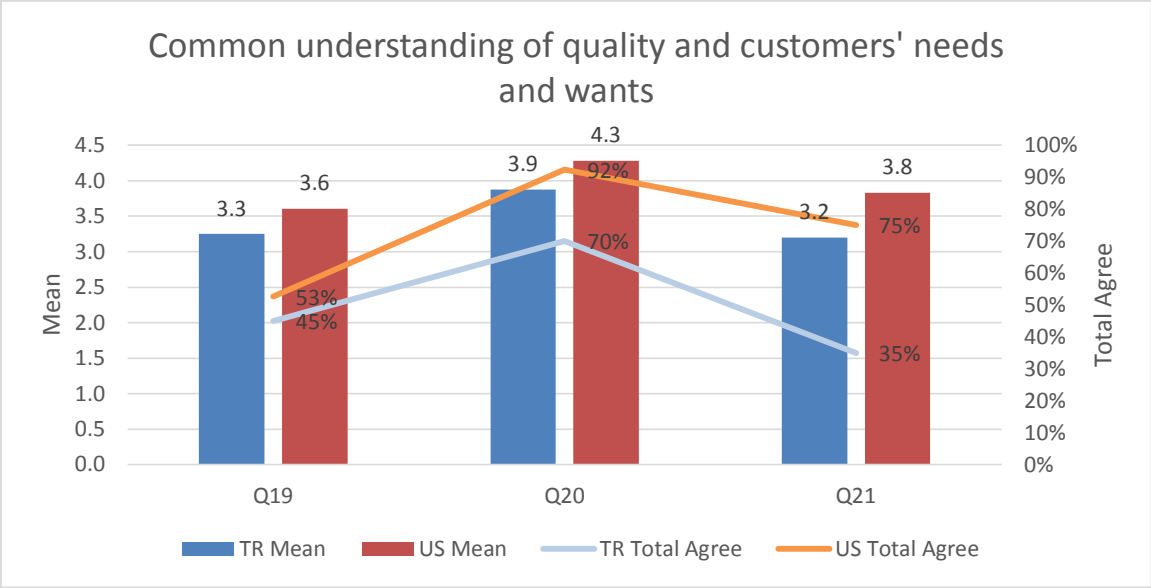


There are little differences between Turkish and U.S. officers' responses both in average and "total agree" columns and Pearson's chi-square test of independence does not show any statistically significant difference for four questions in this factor. The reason may be there are certain standards for almost every military assignment and personnel and jobs are evaluated according to these standards. This standardization practices might make it easier for LSS specialists to analyze processes and identify possible problems. But we are not saying data collection in military organizations is perfect. None of the "total agree" columns is over 80% for both Turkish and U.S. participants. So during a LSS analysis standards for that job need to be reevaluated.

d. Common Understanding of Quality and Customer's Wants and Needs

In this factor, a low "total agree" score indicates confusion about the meaning of quality and the perception that other priorities are frequently "trumping" a commitment to meet the needs and wants of the residents" (Dana, 2004). Questions 19–21 aim to explain organization's priorities among the customers. Figure 28 summarizes the findings.

Figure 28. Comparison of CQI Survey Results forFactor 4

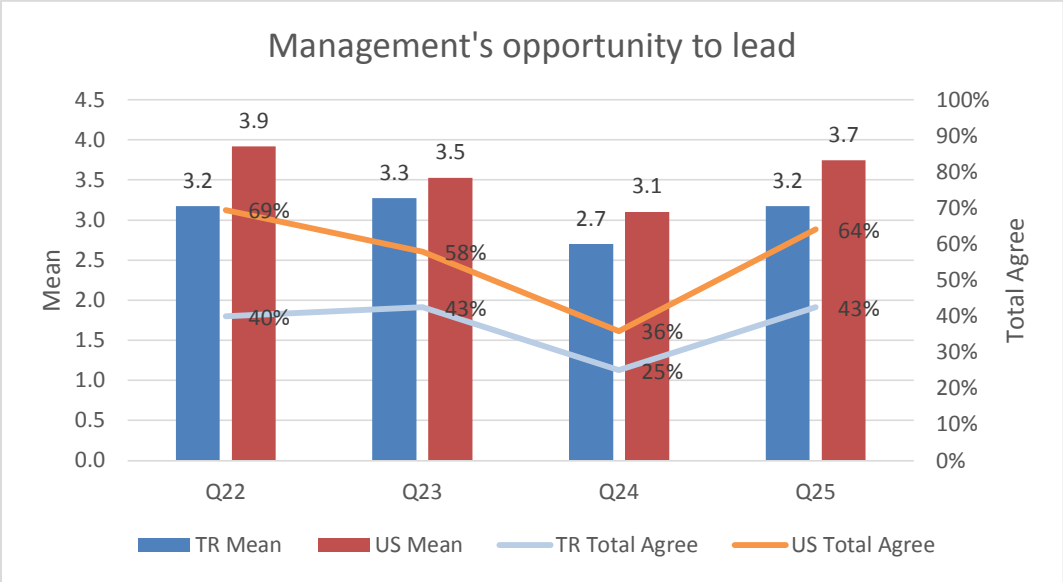


This factor does not seem to contribute our study about Lean Six Sigma implementation but it might worthwhile to discuss the noteworthy difference between two groups for question 21: "Overall, meeting the expectations of our residents and families is a top priority here." This is the only statement in this factor that shows statistically significant difference according to the results of Pearson's chi-square test of independence. We can also see the gap between two groups in "total agree" percentages; 35% for Turkish students and 75% for U.S. students.

e. Management's Opportunity to Lead CQI

Dana (2004) says a low "total agree" result for this factor shows we need to question management styles in the organization before attempting to make any important changes. We will assess question 22 differently than the author since military organizations are non-profit organizations. But still financial decisions are as important as private companies because military organizations spend the taxpayer's money. See Figure 29 for a summary of the results.

Figure 29. Comparison of CQI Survey Results for Factor 5



Two of four questions show statistically significant difference according to Pearson's chi-square test; Q22 about concerns of financial results over quality and Q25 about faith in managers achieving higher quality performance. Looking at the gap between "total agree" columns for Q22, 40% of Turkish respondents and over 69% of U.S. respondents, we may conclude that financial results have an important effect on Turkish military organizations' decisions.

It is reasonable that military leaders need to focus more on financial issues than before due to the burden of accomplishing more goals with smaller budgets. Lean Six Sigma may help military organizations become more cost effective while getting the same level of outcome. Lean Six Sigma will also increase the trust of personnel to their managers for reaching greater levels of quality. Accepting and implementing Lean Six Sigma method will prove the desire of management to improve their organization.

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VIII. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

The purpose of our study was to determine if Lean Six Sigma can be successfully implemented in the Turkish army. As demonstrated in Chapter III of this study, many military organizations in United States took advantage of Lean Six Sigma and improved their processes. Since the change is extremely related with the organizational culture, we tried to find out possible obstacles of LSS implementation due to cultural differences between Turkish and U.S. military organizations.

Even if Hoftsede's cultural dimensions results, explained in Chapter IV and seen in Figure 6, say Turkish and U.S. cultures differ significantly in general we found out that these cultural differences get smaller in the comparison of Turkish and U.S. military organizations. As a result of our "Measuring Organizational Readiness to Change and Continuous Improvement for Lean Six Sigma Implementation" survey, cultural differences between two groups is not an insurmountable hurdle. Cultural differences in terms of readiness to change and continuous improvement between Turkish and U.S. military organizations are not significant. These differences will not prevent implementations of successful Lean Six Sigma projects in Turkish military organizations.

Military organizations generally have a disadvantage for change since change happens slowly and requires quite a lot effort in military organizations. For Turkish military culture we found out that our respondents as middle managers of their organizations are as open to change as their U.S. counterparts. Turkish military culture will accept change initiatives as long as they are supported by senior management and change is communicated well enough among the organization.

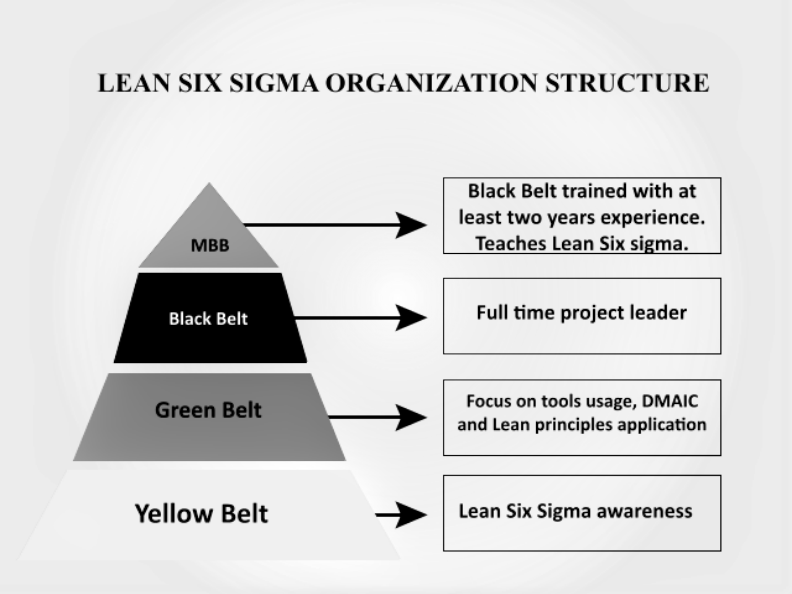
B. RECOMMENDATIONS

We believe Lean Six Sigma is a solid, proven methodology for improving any work process. Many large companies all around the world have been using this methodology for a long time and firms in Turkey started to join this group. In Chapter III we analyzed successful implementations of LSS in military organizations.

Based on the results of our survey, we suggest a brief roadmap to implement LSS in the Turkish army. The first step would be determining the processes to which LSS should be applied and discussing the potential benefits.

The second step would be training personnel to apply Lean Six Sigma projects. LSS has an expertise hierarchy that defines the role of individuals in a LSS project shown in Figure 30. Training of personnel and implementing LSS projects may start at the same time. A green belt certificate requires to finish a LSS project so during their training military personnel might work on small projects coordinated and assigned by instructors and military organizations.

Figure 30. Lean Six Sigma Belts Hierarchy and Roles in the Organization



Source: Lean Six Sigma, (n.d.), retrieved October 23, 2015, from https://en.wikipedia.org/wiki/Lean_Six_Sigma

Cole (2011, pp. 13–29) describes challenges for the public sector to use Lean Six Sigma. In the light of results of our survey, we must consider both Cole's challenges for the Turkish army and possible solutions:

- Hierarchical environment: This can be converted to an advantage if senior management fully support the change efforts and LSS projects.

- Lack of common goals: Military organizations' goals may vary but separate LSS projects can be applied to support different goals.

- Leadership support for organization-wide programs is difficult to obtain: It will be very difficult to monitor change efforts for all Turkish army. Instead LSS project groups can carry out projects in battalion or brigade level even if project subjects are similar.

- Lack of profit or revenue focus: Military organizations can assess success of LSS projects with cost savings and improvements on the standards.

- Lack of customer focus: Military organizations do not have direct customers to measure customer satisfaction level but LSS project teams should publish their results among the whole organization or with the public.

- Limited sense of urgency: Leaders and change agents need to create necessary urgency among the organization subject to change effort.

- High employee turnover: This rate is even higher in military organizations than the other public groups so LSS project team must explain current LSS projects in an organization to newcomers during orientation training. Also change agents need to keep procedures and culture created by LSS teams.

- Mix employee types: LSS project teams will need to explain change initiatives from senior leaders to privates since change will affect all personnel in the organization.

Apte and Kang (2006) provide valuable lessons as a result of their study about Lean Six Sigma implementation experiences in U.S. military organizations. The following lessons are also applicable for LSS deployment in the Turkish army since we have concluded that the perception of readiness for change and continuous improvement in the Turkish army is slightly similar to U.S. military:

- Active support of senior leaders is a necessity: Senior commanders must clarify need for change and promote the change initiative throughout the organization.

- Initial successes are critically important: First projects to implement Lean Six Sigma must be chosen carefully and talented personnel should be assigned. The first successful results will lead expanding organizational support for future LSS projects.

- Emphasize continuing education and training: Belt training is an integral part of Lean Six Sigma. Turkish army needs to start a LSS certification program and deliver required belts to LSS project team members. Each

project must be directed by a black belt and team members should have green belts.

- Monitor the Lean Six Sigma projects: Senior management must give tangible objectives to LSS project leaders and hold them responsible for outcomes.

APPENDIX SURVEY RESULTS

Table 2. NPS Turkish Students Organizational Readiness for Change Results

NPS Turkish Students Measurement of Perceived Organizational Readiness for Change Survey Results	S.ly D (1)	Dis-agree (2)	Neither A Nor D (3)	Agree (4)	S.ly Agree (5)	Mean
A. Commitment of senior management to the change						3.44
1. Senior management is decisive with respect to organizational goals, priorities and strategies concerning the change.	3%	13%	20%	53%	13%	3.60
2. Leaders themselves have bought into the change and promote it by behaving in a manner consistent with the change.	3%	15%	30%	43%	10%	3.43
3. Senior management defines the course of change and stays the course for several years	3%	10%	43%	35%	10%	3.40
4. There is a champion of change at the most senior level of the organization	3%	15%	40%	33%	10%	3.33
B. Competence of change agents						3.18
5. Change agents have done research to select the right type of change that addresses the underlying causes of organizational problems rather than just symptoms	0%	33%	25%	33%	10%	3.20
6. Change agents provide valid arguments to justify the change	0%	33%	25%	35%	8%	3.18
7. Change agents have considered different options of change implementation	5%	25%	20%	30%	20%	3.35
8. Change agents are competent to answer employee questions about the change	3%	33%	30%	33%	3%	3.00
C. Support of immediate manager						3.37
9. Managers are held accountable for passing information on the change to their staff	3%	18%	30%	30%	20%	3.48
10. Managers acknowledge the impact the change may have on their staff	5%	15%	33%	35%	13%	3.35
11. The immediate supervisors encourage their staff to participate in the change process	5%	15%	43%	23%	15%	3.28
D. Poor communication of change						3.28
12. The outcomes and benefits of the change are not well explained	8%	18%	33%	25%	18%	3.28
13. The reasons for the change are not well explained	10%	15%	23%	40%	13%	3.30
14. There is no vision for the change that everybody in the organization understands	13%	23%	13%	30%	23%	3.28
E. Adverse impact of the change on work						3.62
15. The change process does not involve the phasing out of old duties, and the employee is expected to do both the old and the new duties	5%	15%	20%	40%	20%	3.55
16. Workloads do not permit people to get involved in the change initiatives	5%	20%	18%	23%	35%	3.63
17. People are discouraged from saying 'no' to work – even when the assigned task is not a priority	8%	15%	10%	38%	30%	3.68

Adapted from Cinite, I., Duxbury, L. E., & Higgins, C., (2009), Measurement of perceived organizational readiness for change in the public sector, *British Journal of Management*, 20(2), 265–277. doi:10.1111/j.1467-8551.2008.00582.x

Table 3. NPS U.S. Students Organizational Readiness for Change Results

NPS U.S. Students Measurement of Perceived Organizational Readiness for Change Survey Results	S.ly D (1)	Dis-agree (2)	Neither A Nor D (3)	Agree (4)	S.ly Agree (5)	Mean
A. Commitment of senior management to the change						3.67
1. Senior management is decisive with respect to organizational goals, priorities and strategies concerning the change.	3%	10%	25%	45%	18%	3.65
2. Leaders themselves have bought into the change and promote it by behaving in a manner consistent with the change.	3%	8%	20%	43%	28%	3.85
3. Senior management defines the course of change and stays the course for several years	8%	10%	30%	30%	23%	3.50
4. There is a champion of change at the most senior level of the organization	3%	15%	13%	53%	18%	3.68
B. Competence of change agents						3.62
5. Change agents have done research to select the right type of change that addresses the underlying causes of organizational problems rather than just symptoms	3%	10%	30%	45%	13%	3.55
6. Change agents provide valid arguments to justify the change	0%	5%	45%	35%	15%	3.60
7. Change agents have considered different options of change implementation	3%	5%	38%	43%	13%	3.58
8. Change agents are competent to answer employee questions about the change	0%	5%	30%	50%	15%	3.75
C. Support of immediate manager						3.87
9. Managers are held accountable for passing information on the change to their staff	0%	3%	18%	70%	10%	3.88
10. Managers acknowledge the impact the change may have on their staff	0%	3%	28%	48%	23%	3.90
11. The immediate supervisors encourage their staff to participate in the change process	0%	3%	33%	45%	20%	3.83
D. Poor communication of change						2.86
12. The outcomes and benefits of the change are not well explained	5%	38%	30%	23%	5%	2.85
13. The reasons for the change are not well explained	5%	30%	40%	25%	0%	2.85
14. There is no vision for the change that everybody in the organization understands	8%	33%	35%	15%	10%	2.88
E. Adverse impact of the change on work						3.08
15. The change process does not involve the phasing out of old duties, and the employee is expected to do both the old and the new duties	8%	40%	20%	20%	13%	2.90
16. Workloads do not permit people to get involved in the change initiatives	8%	23%	30%	35%	5%	3.08
17. People are discouraged from saying 'no' to work – even when the assigned task is not a priority	8%	23%	30%	18%	23%	3.25

Adapted from Cinite, I., Duxbury, L. E., & Higgins, C., (2009), Measurement of Perceived Organizational Readiness for Change in the Public Sector, *British Journal Of Management*, 20(2), 265–277. doi:10.1111/j.1467-8551.2008.00582.x

Table 4. NPS Turkish Students CQI Climate Survey Results

NPS Turkish Students CQI Climate Survey Listed by Statement Number			Survey Date:				Solicit	Resp.	Pct
			9/25/2015				47	40	85.1%
		Response Distribution						Wgt.	
	Employee Survey Statement	Strongly Agree	Agree	Neither A nor D	Dis-agree	Strongly Disagree		Rating 5.0 Max	Total Agree
1	I know what is expected of me at work.	38%	36%	10%	13%	3%		3.9	74%
2	I have the materials and equipment I need to do my work well.	23%	25%	28%	20%	5%		3.4	48%
3	In the last seven days, I have received praise for doing good work.	10%	41%	18%	18%	13%		3.2	51%
4	Someone at work encourages me to develop my skills.	10%	48%	20%	15%	8%		3.4	58%
5	I receive the information I need to do my job well.	8%	30%	35%	23%	5%		3.1	38%
6	Our employees cooperate and work as a team.	25%	35%	18%	20%	3%		3.6	60%
7	We are encouraged to work with staff in other departments to solve problems.	15%	45%	18%	20%	3%		3.5	60%
8	My supervisor respects my opinion.	18%	50%	23%	8%	3%		3.7	68%
9	I have opportunities to learn new things that will help me improve my work.	23%	41%	23%	13%	0%		3.7	64%
10	Overall, the leaders in this facility care about me.	15%	51%	15%	13%	5%		3.6	67%
11	When something goes wrong, we look at the way we do our work rather than blaming people.	8%	15%	33%	26%	18%		2.7	23%
12	The work assignments are well planned in my department.	15%	13%	41%	13%	18%		2.9	28%
13	We are encouraged to apply better methods for doing our work when we learn about them.	10%	36%	26%	21%	8%		3.2	46%
14	Overall, I am motivated to find ways to improve the way I do my work.	18%	50%	15%	18%	0%		3.7	68%
15	I know how to measure the quality of my work.	20%	35%	30%	15%	0%		3.6	55%
16	I know how to analyze (review) the quality of my work to see if changes are needed.	15%	41%	26%	18%	0%		3.5	56%
17	We usually study the cause of problems before making a change.	13%	30%	35%	18%	5%		3.3	43%
18	Overall, our use of information helps us improve the way we do our work.	20%	25%	20%	30%	5%		3.3	45%
19	Quality improvement is a sincere effort at this facility rather than just talk.	20%	25%	20%	30%	5%		3.3	45%
20	I am encouraged to solve problems brought to me by my customers (residents, families, or other employees).	25%	45%	23%	8%	0%		3.9	70%
21	Overall, meeting the expectations of our residents and families is a top priority here.	10%	25%	43%	20%	3%		3.2	35%
22	Our leaders are just as concerned about the quality of services as they are about financial results.	18%	23%	28%	25%	8%		3.2	40%
23	Our leaders are able to make their own decisions rather than depending on people outside of our facility.	13%	30%	35%	18%	5%		3.3	43%
24	We seldom have crisis situations at this facility.	5%	20%	28%	35%	13%		2.7	25%
25	Overall, the facility managers have the ability to lead us to higher levels of quality performance.	10%	33%	30%	20%	8%		3.2	43%
Average Response to All Statements		16%	34%	25%	19%	6%		3.4	50%
Average Response to Key Dimensions of CQI Readiness									
Internal customer (employee) focus and use of team process (1-10)		18%	40%	21%	16%	5%		3.5	59%
Understanding of process (11-14)		13%	29%	29%	19%	11%		3.1	41%
Use of data in decision-making (15-18)		17%	33%	28%	20%	3%		3.4	50%
Common understanding of quality and customers' needs and wants (19-21)		18%	32%	28%	19%	3%		3.4	50%
Management's capablity to lead change (22-25)		11%	26%	30%	24%	8%		3.1	38%

Adapted from Dana, B., (2004), Continuous Quality Improvement (CQI) Readiness Assessment Process and Tool, American Health Care Association, retrieved September 11, 2015 from http://www.ahcancal.org/ncal/quality/documents/cqi_rai_tool.pdf

Table 5. NPS U.S. Students CQI Climate Survey Results

NPS U.S. Students CQI Climate Survey Listed by Statement Number			Survey Date:			Solicit	Resp.	Pct
			9/25/2015			80	40	50.0%
		Response Distribution					Wgt.	
	Employee Survey Statement	Strongly Agree	Agree	Neither A nor D	Dis-agree	Strongly Disagree	Rating 5.0 Max	Total Agree
1	I know what is expected of me at work.	38%	63%	0%	0%	0%	4.4	100%
2	I have the materials and equipment I need to do my work well.	44%	46%	10%	0%	0%	4.3	90%
3	In the last seven days, I have received praise for doing good work.	25%	38%	25%	13%	0%	3.8	63%
4	Someone at work encourages me to develop my skills.	33%	49%	10%	8%	0%	4.1	82%
5	I receive the information I need to do my job well.	23%	50%	25%	3%	0%	3.9	73%
6	Our employees cooperate and work as a team.	23%	65%	10%	3%	0%	4.1	88%
7	We are encouraged to work with staff in other departments to solve problems.	38%	45%	13%	3%	3%	4.1	83%
8	My supervisor respects my opinion.	31%	51%	15%	3%	0%	4.1	82%
9	I have opportunities to learn new things that will help me improve my work.	21%	59%	21%	0%	0%	4.0	79%
10	Overall, the leaders in this facility care about me.	23%	55%	20%	3%	0%	4.0	78%
11	When something goes wrong, we look at the way we do our work rather than blaming people.	13%	35%	25%	23%	5%	3.3	48%
12	The work assignments are well planned in my department.	10%	43%	35%	13%	0%	3.5	53%
13	We are encouraged to apply better methods for doing our work when we learn about them.	23%	53%	23%	3%	0%	4.0	75%
14	Overall, I am motivated to find ways to improve the way I do my work.	41%	44%	15%	0%	0%	4.3	85%
15	I know how to measure the quality of my work.	36%	44%	18%	3%	0%	4.1	79%
16	I know how to analyze (review) the quality of my work to see if changes are needed.	31%	44%	23%	3%	0%	4.0	74%
17	We usually study the cause of problems before making a change.	20%	50%	18%	10%	3%	3.8	70%
18	Overall, our use of information helps us improve the way we do our work.	21%	32%	34%	13%	0%	3.6	53%
19	Quality improvement is a sincere effort at this facility rather than just talk.	21%	32%	34%	13%	0%	3.6	53%
20	I am encouraged to solve problems brought to me by my customers (residents, families, or other employees).	38%	54%	5%	3%	0%	4.3	92%
21	Overall, meeting the expectations of our residents and families is a top priority here.	17%	58%	17%	8%	0%	3.8	75%
22	Our leaders are just as concerned about the quality of services as they are about financial results.	28%	42%	25%	6%	0%	3.9	69%
23	Our leaders are able to make their own decisions rather than depending on people outside of our facility.	16%	42%	21%	21%	0%	3.5	58%
24	We seldom have crisis situations at this facility.	5%	31%	41%	15%	8%	3.1	36%
25	Overall, the facility managers have the ability to lead us to higher levels of quality performance.	13%	51%	33%	3%	0%	3.7	64%
Average Response to All Statements		25%	47%	21%	7%	1%	3.9	72%
Average Response to Key Dimensions of CQI Readiness								
Internal customer (employee) focus and use of team process (1-10)		30%	52%	15%	3%	0%	4.1	82%
Understanding of process (11-14)		22%	43%	24%	9%	1%	3.7	65%
Use of data in decision-making (15-18)		27%	42%	23%	7%	1%	3.9	69%
Common understanding of quality and customers' needs and wants (19-21)		25%	48%	19%	8%	0%	3.9	73%
Management's capablity to lead change (22-25)		15%	41%	30%	11%	2%	3.6	57%

Adapted from Dana, B., (2004), Continuous Quality Improvement (CQI) Readiness Assessment Process and Tool, American Health Care Association, retrieved September 11, 2015 from http://www.ahcancal.org/ncal/quality/documents/cqi_rai_tool.pdf

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